Integrating Health Care and Housing Supports from Federal Agencies: An Evaluation of the HUD-VA Supported Housing Program (HUD-VASH)

by

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Executive Summary

Background

Supported housing, integrating clinical and housing services, is a widely advocated intervention for homeless people with mental illness. In 1992 the US Department of Housing and Urban Development (HUD) and the Veterans Health Administration of the Department of Veterans Affairs (VA) established the HUD-VA Supported Housing (HUD-VASH) Program at 19 sites. This program combined HUD section 8 Vouchers which provide housing rent subsidies for private residences with intensive case management provided by VA clinicians, to facilitate exit from homelessness and improve the health status of homeless veterans with psychiatric and substance abuse disorders. The Northeast Program Evaluation Center, located on the West Haven campus of the VA Connecticut Healthcare System, was charged with conducting an evaluation of the HUD-VASH program.

Evaluation Methods

The evaluation consisted of two parts, an experimental evaluation to determine the cost effectiveness of HUD-VASH as compared to standard VA care, and an observational outcome study to determine the generalizability of the experimental results to other program sites.

First, four sites participated in a rigorous experimental evaluation in which outcomes and costs were compared among veterans randomly assigned to three groups: (i) the full HUD-VASH intervention with both Section 8 vouchers and case management (n=182); (ii) case management without special access to Section 8 vouchers (N=90), and (iii) standard VA care (N=188).

Second, outcome and cost data from veterans treated in 15 other HUD-VASH program sites (N=976) were compared with outcomes and costs at the experimental HUD-VASH sites to assess whether the results of the experimental evaluation are generalizable to the HUD-VASH program as a whole.

Results

Experimental Evaluation. Over a 3-year follow-up period HUD-VASH veterans had 25% more nights housed in an apartment, room or house, on average, than the standard care group ($p<.0001$) and 16.9% more days housed than the case management-only group ($p<.0001$). The case management-only group had only 7% more days housed than the standard care group ($p=.29$). The

HUD-VASH group also experienced 35% and 36% fewer nights homeless than each of the control groups (both $p<.005$) as well as greater subjective satisfaction with housing ($p<.0001$ for both comparisons). Among those housed, veterans assigned to HUD-VASH reported fewer housing problems (e.g. pests, broken windows, neighborhood crime)($p<.005$ for both comparisons).

However, there were no significant differences between treatment groups on any measures of psychiatric or substance abuse status or community adjustment.

Average three-year VA health costs for HUD-VASH clients were $8,009 (28%) greater than for the standard care group, while costs for case management-only clients were only $6,500 (23%) greater. Costs were also assessed from the more comprehensive perspective of society as whole, which also takes non-VA health costs into account along with the costs of homeless shelters (both of which were lower for HUD-VASH clients) as well as the costs of incarceration, employment productivity (a negative cost), and the administrative costs of transfer payments (including Section 8 vouchers). From this broader perspective, HUD-VASH was $6,200 more expensive than standard care ($2,067 annually) while case management alone was only $3,500 more costly ($1,167 annually).

Cost-effectiveness analysis of these data shows that, from the perspective of VA, HUD-VASH cost $58 more than standard care for each additional day housed (95% confidence interval = $4 to $111), while from the perspective of society as a whole HUD-VASH cost $45 more per days housed (95% confidence interval = -$19 to $108).

Observational study. Comparison of the performance of HUD-VASH sites participating in the experimental evaluation and other HUD-VASH sites showed that veterans at experimental sites had more severe substance abuse problems and evidence of poorer community functioning prior to program entry on some measures. Although experimental sites were more successful at retaining veterans in treatment, delivery of HUD-VASH services was generally similar at observational sites and there were no significant differences in housing or clinical outcomes. Clients at the non-experimental sites received fewer HUD-VASH case management as well as general mental health services, but more inpatient and residential services. As a result annual VA costs were only $602 lower than in the HUD-VASH experimental evaluation and annual costs to society were $385 lower.

Conclusion

Supported housing delivered through the HUD-VASH program yields superior housing outcomes than either intensive case management alone or standard care, but did not yield superior clinical benefits, and modestly increased costs. These findings are broadly generalizable since at non-experimental sites HUD-VASH was associated with similar outcomes and costs. HUD-VASH thus generates superior housing outcomes than standard care at modestly increased costs. Modification of the case management model allowing more flexibility in its intensity and duration, as clinically indicated, might reduce costs without loss of effectiveness.

TABLE OF CONTENTS

Executive Summary ..... **i**
Table of Contents ..... **v**
Introduction **1**
Methods **3**
Results **13**
Part I: Experimental Study **13**
Part II: Generalizability Study **18**
Discussion **21**
References **28**
Acknowledgements **35**
Figures **37**
Tables **47**

Introduction

Delivery of effective services to homeless people with serious psychiatric and/or addictive disorders has been a difficult challenge, in part, because of the need for assistance from multiple agencies in multiple service domains including housing, psychiatric and substance abuse treatment, income support, and social and vocational rehabilitation (Goldman and Morrissey, 1985). Client-level services for this population, as provided by VA (Kasprow et al., 2002) and non-VA agencies, have focused on three principal interventions: 1) outreach, to engage those who have difficulty negotiating entry into complex, fragmented service systems (Lam and Rosenheck, 1999), 2) case management to provide ongoing support and to either facilitate or directly provide access to health care services (Morse, 1999; Lehman 1997; Rosenheck et al., 1995), and 3) residential assistance involving either time-limited transitional assistance with concomitant mental health treatment (Lipton et al., 1988; Rosenheck et al.,1995; Conrad et al., 1998) or longer-term mainstream community housing (Goldfinger et al., 1999, Hough et al., 1997).

Experimental studies have demonstrated statistically significant benefits, albeit of modest magnitude, from intensive treatment models such as Assertive Community Treatment (ACT)(Morse et al., 1992) with benefits more often demonstrated for housing than for clinical status (Morse, 1999). Clinical trials have also demonstrated superior outcomes for interventions in which case management and housing resources of various kinds are combined (Susser et al., 1997, Lehman, 1997; Shern, 2000). One of the major questions in designing services for this population is whether distinct housing resources are necessary or whether provision of intensive clinical services results in receipt of sufficient access to health care, income support, and/or rehabilitation services to facilitate exit from homelessness, without targeted housing subsidies.

Only one experimental study has attempted to disentangle the effect of intensive case management and direct housing subsidies for this population, the San Diego Supported Housing Study (Hurlburt et al., 1996, Hough et al., 1997). That study used a two-by-two study design, crossing rent subsidies with intensive case management, and reported that intensive case management was not associated with greater improvement than standard case management in any outcome domain, but that clients who received rent subsidies were more likely to be independently housed, i.e. residing in an apartment, room, or house in their own name. The findings of this 18-

month outcome study, however, were somewhat ambiguous because: 1) receipt of housing subsidies did not reduce nights of homelessess and, 2) the intensive case management intervention as actually delivered was not dissimilar from the standard care intervention. Thus it remains unclear whether or not linking housing subsidies directly with clinical services results in better outcomes than clinical services alone.

At the interorganizational level, the integration services between mental health and housing agencies remains problematic. Several large multi-site demonstration projects have found that extensive and costly efforts to promote integration of mental health services at the system level did not result in improvements in client outcomes (Lehman et al, 1994; Bickman, 1995; Rosenheck et al., in press), although one sub-study found correlational evidence that in more integrated service systems, homeless persons with mental illness are more likely to obtain housing subsidies and to become independently housed (Rosenheck et al., 1998). In contrast to the lack of clinical impact of these system-wide interventions, a more focused, agency-specific approach to service integration was shown to increase access of homeless veterans to social security benefits (Rosenheck et al., 1999a) and to improve their subjective quality of life (Rosenheck et al., 2000). However, that study did not address integration of clinical and housing services and included only one 3-month follow-up clinical assessment.

To further evaluate approaches to the integration of clinical and housing services we evaluated a joint program linking services of the US Department of Housing and Urban Development (HUD) and the US Department of Veterans Affairs (VA) -- the HUD-VA Supported Housing (HUD-VASH) program. In this program, HUD Section 8 Housing vouchers which provide subsidies for commercial rents, were paired with intensive case management services provided by VA clinicians. The evaluation of this program included two components: an experimental component to assess the cost-effectiveness of HUD-VASH compared to standard VA care and an observational component to determine whether the program as operated at the experimental sites was representative of the program as a whole.

First, in a three-year prospective experimental study we compared outcomes and health care costs of clients randomly assigned to HUD-VASH or to one of two comparison treatments: i) intensive case management provided by the same VA clinicians who staffed the HUD-VASH

program, but without special access to Section 8 vouchers, and ii) standard VA homeless services, typically involving short-term (3-month) contact focusing on linkage with VA health care services (Rosenheck and Gallup, 1991). We hypothesized that, over a three-year follow-up period, case management combined with housing subsidies in HUD-VASH would result in better housing, mental health, and social adjustment outcomes than either control condition, and that intensive case management, in turn, would result in better outcomes than standard care. We further hypothesized that more intensive community treatment in the first two conditions would generate sufficient savings in hospital, halfway house, and shelter services to offset their additional cost (Culhane et al., 2002).

Second, to evaluate the generalizability of the experimental evaluation, the 15 other HUD-VASH program sites collected data using the same measurement instruments as the experimental sites (N=976). These data were used to determine whether client characteristics, services delivery, outcomes, and costs at the experimental sites were representative of those in the program as a whole. This part of the evaluation was necessary because the rigorous evaluation of innovative programs using prospective experimental research designs potentially alters and may seriously distort the conditions under which such programs naturally operate. In the case of the HUD-VASH program, for example, the efforts of case managers at the experimental studies were complicated by the fact that they were simultaneously providing services to clients who had special access to Section 8 Vouchers and to others who did not. Both case managers and clients at these sites may have felt disappointed or even demoralized when assigned to treatment without vouchers on the basis of "the flip of a coin". Case managers at experimental sites may also have made extra efforts to faithfully implement the program model at high levels of service intensity because their work was being carefully studied, thus artificially increasing program costs. By comparing the process and outcomes of treatment at experimental and observational sites we assessed the generalizability of the findings of the experimental study to more general practice.

Methods

The HUD-VA Supported Housing Program (HUD-VASH).

Through an interagency agreement, HUD allocated funds for approximately 1,000 housing

vouchers to be used in a joint HUD-VA program to provide both housing and case management assistance for literally homeless veterans (i.e., those living in streets, shelters, or abandoned buildings) with psychiatric or substance abuse problems (Kasprow et al., 2000). Participants were offered guaranteed access to Section 8 housing vouchers, administered through the usual mechanisms by local Public Housing Authorities. These vouchers authorized payment of a standardized local fair market rent (established by HUD based on surveys of the local rental market) less 30% of the individual beneficiary's income.

Identification of potential candidates and screening for admission to the program were the responsibilities of the professional staff of VA's Health Care for Homeless Veterans (HCHV) program (Rosenheck et al., 1989) to which each experimental HUD-VASH program was linked. To receive a voucher a veteran had to agree to a treatment plan involving participation in case management and other agreed upon services. However, once assigned, retention of the Voucher was not contingent on participation in treatment, and could only be rescinded if the client violated Section 8 program regulations or if 30% of the client's income exceeded the full value of the local fair market rent.

The case management intervention promoted active liaisons between clients and the Public Housing Authority to facilitate the administrative processes involved in using the voucher. Case managers also eased the transition to independent living by helping clients to: i) locate an apartment, ii) negotiate the lease (meeting face-to-face with the landlord if the client wished), and iii) furnish and move into their new apartment. The case management model used in HUD-VASH was modified from the ACT model (Stein and Santos, 1998) and encouraged at least weekly face-to-face contact, with more intensive involvement to deal with crisis situations. The majority of contacts, at least initially, focused on housing adjustment and took place in community settings such as the client's apartment. Case managers, most of whom were experienced social workers and nurses, were also encouraged to provided substance abuse and employment counseling and/or to facilitate linkage with other VA services.

Each HUD-VASH program consisted of two case managers and an allocation of 50 vouchers. Thus intended maximum caseloads would be 25 clients per case manager. Admission was staggered so that case managers could work intensively with clients as they made the transition to independent

housing. Contacts were less frequent as clients became established in their residences. The case management commitment to each client was for at least five years, although no specific time limit was set.

Study Design and Data Collection

Administrative intake forms documenting housing and clinical status at the time of the initial outreach assessment by the HCHV program (prior to referral to HUD-VASH) were used, with other clinical information, to determine eligibility for HUD-VASH. This data also allowed statistical comparison of HUD-VASH participants and other eligible veterans at the participating sites.

After providing written informed consent and completing baseline assessments, veterans were randomly assigned through a centralized procedure to either: 1) HUD-VASH (case management plus vouchers), 2) case management-only, or 3) standard care, which consisted of short-term broker case management as provided by HCHV program outreach workers. In the case management-only condition, case managers were to provide the same intensity of services as in HUD-VASH and were encouraged to use whatever housing resources could be obtained for their clients other than the set-aside vouchers. An additional staff member was funded to provide these services, and all 3 case managers treated some HUD-VASH and some control clients. Veterans were not prevented from obtaining Section 8 vouchers from sources other than the specific allotment for HUD-VASH. The randomization was weighted so that half as many veterans were assigned to case management alone as to the other two groups, to assure that the vouchers would be used in a timely fashion.

Baseline and follow-up assessment interviews were conducted every three months by trained evaluation assistants, not involved in the direct delivery of clinical services. In addition, VASH clinicians used a structured form to document their efforts to assist their clients to obtain their vouchers and apartments during the initial housing search, and completed structured summaries of case management services provided to each client, every three months.

Participants

The sample included veterans eligible for VA services who were contacted through VA community outreach efforts (Rosenheck et al, 1987), based at VA medical centers located in San Francisco; CA, San Diego CA; New Orleans, LA; and Cleveland OH. Veterans were eligible for

HUD-VASH if they were literally homeless at the time of assessment (i.e. living in a homeless shelter or on the streets); had been homeless for 1 month or more; and had received a clinical diagnosis of a major psychiatric disorder (schizophrenia, bi-polar disorder, major affective disorder, PTSD) and/or an alcohol or drug abuse disorder.

All veterans provided written informed consent to participate in the study and the protocol was approved by the Human Investigations Committees at each medical center. Veterans received $20 for their participation in each interview.

Recruitment for the study took place from 1992 and 1995. During this time 3,489 veterans contacted through outreach at the four sites met minimal eligibility criteria of whom 460 (13.2%) gave written informed consent to participate in the study. Compared to all other eligible veterans (including both those who refused and those who were not asked to participate), those who joined the study were slightly younger (42.0 vs. 42.8 years, df=637, t=2.2, p<.03), more likely to be female (4.2% vs. 1.8%, chi square =11.3, df=1 p<0.001), black (64% vs. 57%, chi square=7.1, df=1, p<0.008), had fewer nights of literal homelessness in the previous 60 days (26.1 vs. 27.1 nights, t=2.8, p<.01), fewer alcohol problems (0.22 vs. 0.24, df=3487, t=2.1, p<.02), but a greater likelihood of past hospitalization for drug abuse (49.8% vs. 39.5%, chi square =17.3, df=1 p<0.001), and were both more likely to be admitted to the residential treatment component of the HCHV program (29.1% vs. 10.9%, chi square =119.7, df=1, p<0.001), and to have indicated interest in receiving VA services at the time of the initial assessment (93.1% vs. 81.3%, chi square =38.8, df=1, p<0.001). Participants thus showed evidence of more severe illness on some measures and somewhat greater motivation for treatment.

Measures

Demographic and clinical characteristics. Data were obtained on current sociodemographic characteristics including age, gender, race, days employed, income, receipt of public support payments, duration of the current episode of homelessness, and housing status during the 90 days prior to each interview. Housing status questions recorded the number of nights in the previous 90 that the client spent in each of 11 different types of residence. The primary outcome measures were the number of nights housed in the previous 90 (i.e. sleeping in an apartment, room or house of one's own or of a family member or friend) and the number of nights homeless (i.e. sleeping in an

emergency shelter, substandard single room occupancy hotel, or outdoors, on the sidewalk, or in a park, abandoned building, automobile, truck, or boat). A third residual housing category documented nights in institutions (e.g. hospitals, halfway houses, jails etc.).

Psychiatric, alcohol, and drug problems were assessed using specific items and composite scores from the Addiction Severity Index (ASI) (McLellan et al., 1980). Psychological distress was measured with the Brief Symptom Inventory (BSI)(Derogatis and Spencer, 1982.) Diagnoses were based on the working clinical diagnoses of the case management teams.

Overall subjective quality of life and satisfaction with current housing, family relationships, social relationships, health care, and finances, were evaluated using subscales from the Lehman Quality of Life Interview (1988).

Among those who were housed, the quality of their residence was further assessed using two scales developed for the Robert Wood Johnson Program on Chronic Mental Illness (Newman et al., 1994): one that addressed positive characteristics of the residence (e.g. safety, proximity to shopping, affordability, adequate size and privacy) and another that measured housing problems (e.g. pests, broken windows, neighborhood crime, plumbing problems). At baseline clients were ask to rate the quality of the last place in which they were housed for 30 or more days using these measures. At follow-up only clients with independent housing were asked to rate the quality of the housing on these scales.

Recent history of arrests for major (i.e. felony) or minor crimes was documented using items from the ASI.

Social support was measured in three ways: by the average number of types of people who would help with a loan, transportation or help in an emotional crisis)(Vaux and Athanassopulou, 1987), the number of people in 9 different categories to whom the veteran reported feeling close, and an index of the total frequency of contact with these people (Lam and Rosenheck, 1998).

Two measures addressed developmental history. Past conduct disorder was measured by reports of eleven behaviors occurring before the age of 15 (e.g., being in trouble with the law or school officials, playing hooky, being suspended or expelled from school, or doing poorly academically) (Helzer, 1980). Family instability in childhood was measured with an 11-item scale that addressed experiences before the age of 18 such as parental separation, divorce, death or poverty

(Kadushin et al., 1981).

Treatment process. Six kinds of indicators were used to compare services provided to each treatment group during the study. First, VA administrative workload data were used to determine the proportion of clients who had any case management contacts with the HUD-VASH or HCHV programs during each year and the average number of contacts among those who had contacts.

Second, the nature of the therapeutic alliance between each veteran and their case manager was measured by a five-item rating scale completed separately by both the clinician (Cronbach's alpha=.85) and the veteran (cronbach's alpha=.86) using a modified version of the Working Alliance Inventory (Horvath and Greenberg, 1987; see also Neale and Rosenheck, 1995 and Chinman et al., 2000). This measure includes items that address the extent to which case manager and client share goals, understand one another, view their working relationship as effective. To preserve confidentiality, veteran assessments of their alliance with their case manager were self-administered in private and mailed in a separate envelope so that the responses would not be seen by any program staff, including the research assistants.

Third, data were obtained on the use of Section 8 housing vouchers in all three groups, and on the initial housing search for those assigned to HUD-VASH, using a structured activities questionnaire.

Fourth, data from the quarterly case manager summaries were used to compare case management services provided to each group during the first year after randomization. Since many veterans entered the program during an episode of residential treatment, we also compared the average number of days from randomization to re-entry into the community.

Fifth, the reasons for discharge were compared among those who terminated their involvement in case management during the three- year study period.

Finally, sixth, we compared annual VA mental health outpatient service use in each group during each year of the study (i.e. the number of psychiatric and substance abuse contacts other than those with HUD-VASH or HCHV program staff).

Assessment of Health Care Costs

Health care costs were estimated from both the perspective of the sponsor of VASH (the VA) and of the health care system more generally.

VA health care costs were estimated by multiplying the number of units of service consumed by each patient by the estimated unit cost of each type of service, using VA cost data from Fiscal Year 1996 and methods developed previously (Rosenheck et al.,1999b). The costs of HUD-VASH case management were estimated separately using more detailed data on program expenditures (Rosenheck, Frisman, and Neale, 1995).

Service Utilization. VA health service utilization data were derived from VA's comprehensive national workload data systems: the patient treatment file (PTF, for inpatient care) and the outpatient care file (OPCF); and program monitoring data on the delivery of residential treatment through HCHV contracts with community agencies and through VA's Domiciliary Care for Homeless Veterans (DCHV) programs. VA inpatient and residential services were classified into 6 types: i) psychiatric hospital care, ii) substance abuse hospital care, iii) medical-surgical hospital care, iv) VA residential care (halfway houses), v) HCHV contract residential treatment and vi) DCHV residential care. Outpatient care was classified into 4 types on the basis of clinic stop codes in the OPCF: i) psychiatric care, ii) substance abuse care, iii) case management provided by specialized homeless programs, and iv) medical-surgical care.

VA Unit costs. Unit costs for VA inpatient, residential care, and outpatient treatment were estimated on the basis of data from VA's Cost Distribution Report (CDR). The CDR is a facility-by-facility accounting record that identifies total expenditures and unit costs associated with VA inpatient and outpatient health care services, nationwide. Using accounting procedures standardized across the entire VA system, both direct health care costs (personnel services and supplies) and indirect costs (administration, building maintenance, engineering service, equipment depreciation, etc.) are identified and distributed to each major type of health care service. The cost of HUD-VASH case management was based on more specific data on staff salaries and workloads when the program was fully implemented.

Summary of VA costs. Costs at the level of each patient were aggregated into six categories: i) inpatient mental health (psychiatric and substance abuse care); ii) inpatient medical-surgical; iii) residential treatment (half-way house, HCHV and DCHV); iv) outpatient mental health; v) outpatient homeless services; and vi) outpatient medical surgical services.

Non-VA Health Costs. Utilization of non-VA services was documented through quarterly

patient interviews which recorded the use of non-VA medical and mental health inpatient, residential, and nursing home care; non-VA medical-surgical outpatient care and non-VA mental health outpatient care. Non-VA unit costs were estimated from several sources including analysis of costs in the 1998 MARKET SCAN (R) data set (Leslie and Rosenheck, 1999), a compilation of all insurance claims from over 500,000 private sector mental health service users; and published studies that identify unit costs in large non-VA health care systems (Dewan, 1999; Weisner et al., 2001).

Non-Health Care Costs

Non-health care costs were also evaluated using interview data documenting the number of nights spent in shelter beds or in jail or prison; the administrative costs of cash transfer payments (e.g. VA benefits, SSI, SSD); employment productivity (i.e earnings), which were considered a negative cost, and the administrative cost of the Section 8 vouchers. Neither cash transfer payments nor the housing subsidies themselves were included in the evaluation of costs from the perspective of society, because they do not involve consumption of resources, but rather movement of resources from one owner to another (see discussion in Frisman and Rosenheck, 1996). Per diem estimates of the cost of shelter and jail days were based on published literature (Culhane et al., 2002) as were the proportion of transfer payments attributable to administrative costs (Frisman and Rosenheck, 1996).

The administrative cost of the Section 8 Vouchers were estimated by multiplying the number of months each veteran received a Section 8 subsidy during the three year follow-up period and by HUD's estimated monthly administrative cost for the Section 8 program at each locality (US Department of Housing and Urban Development, 1994).

Although not included in the estimate of health system or societal costs, we also calculated the value of housing subsidies received by program participants by subtracting 30% of monthly income from reported monthly rent among clients who identified themselves as Section 8 beneficiaries.

Costs were thus estimated from 3 perspectives: the Veterans Health Administration, alone; the broader health care system (VA and non-VA); and society as a whole (including all resource consumption).

Analysis

Part I: Experimental Study

In the analysis of data from the experimental study, we first evaluated the effectiveness of the randomization by comparing baseline characteristics of clients randomly assigned to each of the three groups using analysis of variance for continuous variables and chi square tests for categorical variables.

Next, we compared housing procurement processes and delivery of case management services across the three groups to determine whether the intended differences in access to housing-related services and case management had been achieved.

The analysis of housing and clinical outcomes was based on interview data. Although efforts were made to conduct follow-up interviews every three months, in order to minimize missing data, the follow-up periods selected for analysis were baseline, 6, 12, 18, 24 and 36 months and all interviews conducted during each interval were included. Because we planned to compare the groups during five intervals following the baseline assessment we used a repeated measures with mixed effects analytic strategy. This method was chosen to allow use of all available data from each subject during each follow-up interval. Using Hierarchical Linear Modeling, we modeled random effects for each subject to adjust standard errors for the non-independence of observations within subjects (i.e. for the correlation of values within subjects over time)(Bryk and Raudebush, 1992). The repeated measures approach was chosen because it does not assume any particular functional form (e.g. linear or quadratic outcome trajectories) but rather allows: a) comparison of groups averaged across all time points (i.e. a cumulative area under the curve approach) and b) comparison of each experimental group (HUD-VASH and case management alone) with the standard care group at each specific time point. Adjustment for individual fixed site-effects were also included in each model. All analyses were conducted using SAS (R) version 8.0 with an alpha level of $p<.05$.

Differential follow-up rates. Comparison of follow-up rates between groups over the three-year period showed significant differences in follow-up rates within each assessment period from the six-month assessment (chi square = 10.3, df=2, $p <.006$) through the 3 year assessment (chi square = 55.1, df=2, $p <.0001$) with higher follow-up rates in voucher plus case management group (80%, 84%, 78%, 77% and 70% at 6 months, 1, 2, and 3 years, respectively, see Figure 1) than in the case

management-only group (66%, 69%, 73%, 61%, 48%). Follow-up rates were even lower in the standard care group (67%, 60%, 59%, 49%, 40%), beginning at one year. Since the more intensive treatment models (i.e. HUD-VASH and case management-only) were designed to be more effective in retaining patients with poor outcomes, our results may be conservatively biased against these interventions.

Two strategies were used to address this potential bias. First, patients actually followed up at each time point were compared on baseline characteristics, and measures for which significant differences were identified were included as co-variates in subsequent analyses.

Second, marginal structural modeling was used to inversely weight observations from patients on the basis of their likelihood of being followed up (Robins, 1993; Robins and Finkelstein, 2000). In this approach, survival analysis is first used to model the likelihood that each observation for each subject will be available for analysis. The predicted probabilities are then used to inversely weight each observation so that available observations from clients with characteristics are similar to those who were not followed up are given a greater weight.

Since the results did not differ substantially across these analytic strategies, we present data from the first, and simplest analysis, which merely included baseline variables that differed between groups interviewed at one or more follow-up time points as co-variates.

Cost-Effectiveness. Incremental cost-effectiveness ratios were used to compare the cost-effectiveness of each of the experimental conditions with standard care (Gold et al., 1996. The incremental cost-effectiveness ratio is the ratio of difference in costs (cost of the experimental treatment less the cost of standard treatment) to the difference in effectiveness (the effectiveness of the experimental treatment less the effectiveness of standard treatment) and represents the additional cost of each additional unit of effectiveness, e.g. dollars spent for each additional day housed. The 95% confidence interval of the combined incremental cost effectiveness ratio was computed using the methods described by O'Brien et al. (1994).

These analyses require complete data for all subjects over a specified period of time. While complete data were available for VA health costs, there was substantial missing data on clinical and housing outcomes and on non-VA resource use, since client interviews were the only source of this information. We used multiple regression models to impute missing data. First, a series of models

were estimated in which housing outcomes or service use were the dependent variables and measures of baseline clinical status, and dichotomous dummy-coded variables representing treatment group and time interval were the independent variables. These models were then used to generate estimated values of these dependent variables for each client at each time point, which were used to impute the missing values. Because we use imputed figures as real values we underestimate, to some degree, the uncertainty of the computed cost-effectiveness ratios.

To examine longitudinal cost trends we conducted a series of Analyses of Variance comparing VA health care costs between groups at 6-month intervals from the year before randomization to three years after. We focus on VA costs for this longitudinal analysis because they are based on administrative data that are available at all time points and account for 77% of all health costs (range 73%-82% across groups).

Part II: Generalizability Study

Analytic methods in the generalizability study were the same as those used in the experimental study, but were used to compared two groups (HUD-VASH experimental subjects and HUD-VASH observational subjects) rather than three groups (HUD-VASH experimental vs. case management-only vs. standard care). Because data at the 15 observational sites were collected by clinical staff rather than independent evaluation assistants, there was far more missing data, especially in the third follow-up year. To maximize comparability we only present two-year follow-up comparisons for this component of the evaluation.

Results

Part I: Experimental Study

Baseline characteristics

There were no significant differences between groups as randomized on any sociodemographic, clinical or community adjustment measure at baseline (Table 1).

Those successfully completing follow-up interviews were more likely to be black, to have been employed at baseline, and had greater total income at baseline. These baseline measures were included as co-variates in subsequent analyses.

Program participation

Comparison of workload data showed greater participation rates and greater numbers of

visits with program staff among participants in the HUD-VASH group than in the case management-only group and in the case management-only group than in the standard care group, across all years (Table 2, panel I).

Clinician-rated therapeutic alliance scores in HUD-VASH were significantly higher than in the other two groups during the first year of treatment (Table 2, panel II). While they remained higher than scores for the case management-only group, in subsequent years, they were not significantly different from the much reduced standard care group.

Veteran-rated therapeutic alliance scores showed a similar pattern with the highest ratings observed for HUD-VASH in the first year, but no significant differences in subsequent years (Table 2, panel II). It is notable that both clinician and client ratings for the standard care group were higher than for the case management-only group, even though these differences were not statistically significant. It appears, again, that the small number of clients who remained in treatment in the standard care group were the more satisfied, and presumably more successful members of that group.

Over three-fourths of veterans assigned to the voucher condition received them (78%), as compared to only 5.6% and 1.6% in the other two groups, and they received their vouchers 3 months after randomization, far sooner than the small number of controls who eventually received vouchers (Table 2, panel III). As planned, HUD-VASH case managers were actively involved in the housing search, meeting with prospective landlords for 72% of clients, and helping furnish apartments for 51%.

Clients re-entered the community about 3 months after randomization, on average, with no significant difference between groups (Table 2, panel IV). During the first year of case management, HUD-VASH clients received somewhat more intensive services than other groups, especially in the housing domain.

The fifth panel of table 2 presents data on reasons for termination as appraised by the case managers (more than one reason could be identified). Altogether 31% of clients who terminated from HUD-VASH did so, at least in part, because they lost their voucher, while substance abuse played a role in termination for 50% of both the HUD-VASH and case management-only groups, but for only 30% of the standard care group. Greater proportions of veterans in both case management

conditions terminated because they could not tolerate the closeness of the case management relationship, presumably reflecting the more intensive involvement in these treatment conditions. Clients in the case management-only group were twice as likely as clients in the other two groups to leave the program to seek services elsewhere, perhaps reflecting their disappointment at being assigned to case management without having access to a housing voucher. Unexpectedly, standard care clients, who terminated earlier than those in the two case management conditions, were most likely to be judged by their case managers to have shown substantial improvement at the time of termination, perhaps because their case managers set less ambitious short-term goals for them.

All three groups showed substantial use of VA mental health services, declining progressively over the years of the study (Table 2, panel VI). While there were no significant differences in mental health service use during the first year, service use was substantially higher in the HUD-VASH group in the second year. Clients in the all groups, including HUD-VASH, received more general VA mental health services than HUD-VASH or HCHV case management services, with especially high levels of service use observed among HUD-VASH clients in the second year of the study.

These data constitute strong evidence that the treatment conditions differed in the expected ways, although the case management-only group seems to have received somewhat less intensive case management services than the HUD-VASH group.

Outcomes

Averaging across all time points, over the 3-year follow-up period veterans assigned to HUD-VASH had 25% more nights in an apartment, room or house than the standard care group ($t=4.88$, $p<.0001$), and 16.9% more days housed than the case management-only group ($t=2.90$, $p<.0001$)(Table 3). Differences were significant across time periods for the first two years but attenuated in year 3 (Figure 2). The case management-only group had only 7% more days housed than the standard care group ($t=1.06$, $p=.29$)(Table 3).

Veterans assigned to HUD-VASH had 36.2% fewer nights homeless than the standard treatment group ($t=3.56$, $p<.0004$) and 35.8% fewer nights homeless than the case management-only group ($t=2.87$, $p<.004$). There was no significant difference between the case management-only

group and the standard treatment group (t=.05, p=.96) (Table 3). Differences were significant across time periods for the first two years and then attenuated in years 2 and 3 (Figure 3). Veterans in HUD-VASH also spent fewer nights in institutions than the standard care group (t=2.46, p<.01), but there were no differences between the case management-only and standard care groups (Table 3)(Figure 4).

Consistent with these objective findings, veterans in HUD-VASH reported greater subjective satisfaction with housing than either of the other groups and, among those who were housed, experienced fewer housing problems (Table 3). Those who were housed also experienced higher housing quality (i.e. more desirable features) than the standard care group, but not than the case management-only group.

There were no significant differences between the groups on any clinical or community adjustment outcome measure (Table 3, Figures 5-7) although improvement is apparent among all groups on most measures.

Veterans assigned to HUD-VASH had larger social networks overall (numbers of people they felt close to) (Table 3)(Figure 8) and were more satisfied with their family relationships than either of the other groups (Table 3). On several measures they had better social relations and subjective quality of life ratings than the case management-only group, but they did not have not significantly better social relationships than the standard care group on these measures (Table 3).

Costs

VA health costs were substantial, averaging $33,144 over 3 years or about $11,000 annually across the three groups in the sample, although these costs were lower than health care costs reported in several non-VA studies of homeless service programs (Rosenheck, 1999). Total three-year VA costs for HUD-VASH clients were $8,009 (28%) greater than those for the standard care group (Table 4) while costs for the case management-only group were $6,580 greater (results of cost analyses are discussed as differences and percent difference between the means presented in the tables).

The difference between the HUD-VASH group and the standard care group was almost entirely attributable to the statistically significant $4,905 (774%) greater homeless program costs and $2,454 (32%) greater outpatient mental health costs, contributing to the $7,381 (74%) greater total

outpatient costs for this group as compared to standard care.

There were no significant differences in inpatient/residential treatment costs between the groups.

Longitudinal analysis showed substantial declines in VA costs for all three groups following randomization (Figures 9 and10). There were no significant differences between groups in either total VA health costs (data not shown) or VA inpatient and residential treatment costs (Figure 9) at any time point. HUD-VASH clients had significantly higher VA outpatient costs (including HUD-VASH costs) than both of the other groups during the first year (Figure 10). From 12-18 months there were significant differences between all three groups, and from 18 months to three years both the HUD-VASH and the case-management only groups had greater outpatient costs than the standard care group (Figure 10).

Three-year non-VA health costs were estimated to be $1,047 (10%) less for HUD-VASH clients than standard care clients but $3,468 (32%) less for case management-only clients than for standard care clients (Table 5). Since the case management-only group made more extensive use of VA inpatient and residential services than the other two groups, their need for non-VA care may have been limited (Table 4). Combining VA and non-VA health cost data we estimate that, from the perspective of health care system as a whole, costs for HUD-VASH clients were $6,962 (18%) greater than costs for standard care clients, while costs for case management-only clients were $3,112 (8%) greater (Table 5).

Total non-health costs in HUD-VASH were $762 (47%) less than standard care while non-health costs were $388 (24%) greater for case management-only than standard clients (Table 5). Although HUD-VASH clients had significant savings in shelter days and non-VA mental health costs, the administrative costs of the vouchers over 3 years were substantial at $967.

Combining health care and non-health care costs to estimate costs from the perspective of society as a whole, HUD-VASH clients consumed $6,200 (15%) more resources than standard care clients while case management-only clients consumed $3,500 (9%) more resources. On an annual basis the incremental cost of HUD-VASH to society was about $2,067 and about the same as the cost of widely used treatments such as atypical antipsychotic medication in schizophrenia (Rosenheck et al., 2001).

Cost-Effectiveness

Cost-effectiveness ratios based on both housing and cost data show that, from the perspective of VA, costs were $58 more for HUD-VASH clients than for standard care clients for each additional day housed (95% confidence interval = $4 to $111). Broadening the analysis to total societal costs reveals $45 greater expenditure of societal resources on HUD-VASH clients for each additional day of housing (95% confidence interval = -$19 to $108).

Part II:Generalizability Study

Entry characteristics. At the time of intake assessment veterans receiving HUD-VASH at the four experimental sites were similar to those at the 15 other HUD-VASH program sites on most measures. However, they were 2 years younger, 20% more were black, 10% more received public support payments, and 6% more had substance abuse diagnoses (Table 6). Veterans at experimental sites also reported significantly more days of both alcohol and drug use and scored higher on the ASI composite drug problem index. They had slightly more serious medical problems, fewer had used VA services prior to intake, and they had a poorer record of employment, less social support and greater involvement in major crimes. Veterans at the experimental sites thus had more severe substance abuse problems and evidence of poorer community functioning prior to program entry. Statistical adjustment was made for these differences in outcome analyses.

Treatment Involvement. The proportion of program entrants who received services from VA homeless programs were not significantly different at the experimental as contrasted with observational sites in the first year, but they were substantially greater in the second year after program entry (Table 7, Panel I).[1] Among those with any contact with these programs there was no significant difference in the number of contacts during either the first or second year. The total duration of involvement among HUD-VASH participants at experimental sites was significantly

[1] Note that some of the data for the HUD-VASH experimental group in Table 7 and 8 are different from those in Table 2 and 3. Comparisons in Table 2 and 3 were based on time intervals following the date of random assignment to treatment group. Since there was no random assignment for the observational group, the date of the baseline interview was used as the reference time point for analysis of administrative data.

greater, up to the two year point. These data suggest that the experimental sites were more successful at sustaining involvement in the program than other sites but did not provide any more intensive services to those who were retained.

Clinician alliance ratings were not different across site types in the first year of treatment but were significantly lower at experimental sites in the second year (Table 7, Panel II). Poorer clinician alliance ratings in the second year may reflect the greater success at retaining clients who were less satisfied at experimental sites -- perhaps because involvement with the evaluation (for which they were paid $20 per interview) enhanced their motivation for continued involvement.

Client alliance ratings were marginally greater at observational sites in the first year (p=.051) but not in the second year (Table 7, Panel II).

There were few differences between the groups in the conduct of the initial housing search although 22% more clients at experimental sites actually received vouchers, again reflecting better program retention, although case managers helped clients furnish their apartments in about 14% fewer cases (Table 7, Panel III).

There were several significant differences in reports of service delivery in the first year between experimental and observational sites, but these did not suggest consistently greater model fidelity for either group of clients (Table 7, Panel IV). HUD-VASH clients at experimental sites had more help with employment, locating an apartment, obtaining or keeping housing, and were more likely to receive rehabilitation or substance abuse services from their HUD-VASH case managers. Clients at observational sites, in contrast, received more help obtaining public support income and were more likely to receive psychotherapy services from their HUD-VASH case managers.

There was only one difference in reported reasons for termination: a greater proportion of veterans at experimental sites were terminated as a result of difficulty tolerating closeness with their case managers (Table 7, Panel V).

In contrast to the general comparability in receipt of HUD-VASH services across groups, veterans at experimental sites received significantly and substantially more general psychiatric and substance abuse services from VA in both the first and second years of program involvement (Table 7, Panel VI).

Thus, while experimental sites were more successful at retaining veterans in treatment, there

were few significant or systematic differences in receipt of HUD-VASH services, although clients at the experimental sites received more extensive mental health services outside of the HUD-VASH program.

Outcomes. There were no statistically significant differences in two-year housing or clinical outcomes between veterans treated at experimental sites as compared to observational sites, although veterans at observational sites were housed more days and homeless fewer days (Table 8).

Costs. VA outpatient costs were $4,479 (49%) greater at experimental sites than at observational sites reflecting both greater retention in HUD-VASH and greater use of general VA mental health services (Table 9). However, these higher VA outpatient costs were largely offset by $3,276 (18%) greater VA inpatient and residential treatment costs at observational sites. It is possible that the more intensive outpatient care provided at experimental sites resulted in lower inpatient and residential costs, but these casual associations do not support demonstrate causal inferences. Overall VA costs were $1,203 (4%) greater over two years at the experimental sites or only about $600 more annually (Table 9).

Two-year non-VA health costs were also very similar, and were estimated to be only $268 (4%) greater at the experimental HUD-VASH sites than at the other 15 sites (Table 10).

Total costs. Combining VA and non-VA cost data shows that, from the perspective of health care system as a whole two-year HUD-VASH client costs at the experimental sites were $1,472 (4 %) greater than at observational sites (Table 10).

Non-health costs (including homeless shelter and jail days, administrative costs of transfer payments less employment earnings) were also very similar -- $702 lower at the experimental sites than at the observational sites (Table 10).

When VA and non-VA health costs and non-health costs are combined, HUD-VASH clients at the experimental sites had costs that were minimally greater than at the observational sites ($770 or 2% of total costs).

Cost-Effectiveness

Although differences in neither housing outcomes nor costs were statistically significant, costs were slightly lower and housing outcomes slightly better at observational sites, suggesting that the programs may have some tendency to be more cost effective at these sites.

Discussion

This three-year experimental study found that the integration of housing and clinical services in HUD-VASH strongly increased access to an integrated array of housing subsidies and case management services among designated clients. As a result, HUD-VASH participants had 25% more nights housed than veterans in standard care veterans, 36% fewer nights homeless, and with significantly greater subjective satisfaction with housing. Among those housed, fewer reported housing problems.

However, while our main hypothesis concerning the combination of subsidies and case management was confirmed for our primary outcomes, we found no benefit of case management without housing vouchers over standard care, and no general improvement in health status or community adjustment in association with either experimental intervention, although the HUD-VASH group had more extensive social relationships than both the case management-only group and standard care on several measures. Annual VA health costs were modestly greater for HUD-VASH than for standard clients although reductions in shelter and non-VA health costs further reduced estimated costs for HUD-VASH clients from the perspective of society as a whole.

The benefits of HUD-VASH were fully realized at the 15 sites that did not participate in the experimental evaluation, suggesting that the model can be effectively implemented at a broad range of locations. Since costs for HUD-VASH were somewhat lower at observational sites without any loss of effectiveness, the program may be more cost-effective if more flexibly implemented.

Comparison with Other Studies

The findings for housing outcomes reported here are more robust than those of the only previous effort to differentiate the impact of housing subsidies and case management. HUD-VASH led to both increased days housed and reduced homelessness while the San Diego Supported Housing Study (Hough et al., 1997) found assignment to the voucher condition resulted in more days of independent housing but no reduction in homelessness. Since our sample was diagnostically more heterogeneous than that of the San Diego study and included a large proportion of clients with primary substance abuse disorders, it is possible that the differences in findings are attributable to differences in the clinical needs of the study participants. However, further analysis of HUD-VASH

data showed results were not different for the subgroup of veterans with primary substance abuse disorders than for those with serious mental illness.

Like the San Diego study, we found no advantage for case management in the absence of vouchers. Other studies, in contrast, have reported gains in housing, and on some clinical measures with case management interventions based on the ACT model (Morse, 1999; Lehman 1997; Susser et al., 1997; Herman et al., 2000; Shern et al., 2000). One possible explanation for these differences in results is that the intended caseloads in both HUD-VASH and the San Diego program (20-25 cases per case manager) were larger than those in typical ACT programs (10 cases per case manager). However, almost all the evaluations of ACT in homeless populations have included special access to housing resources (Morse et al., 1999 is the exception), and thus were not pure evaluations ACT alone, i.e. in the absence of housing resources.

One of the unique features of the HUD-VASH evaluation is the availability of comprehensive administrative data on non-program mental health service use. These data show that both of the experimental groups and the standard care group had far more visits with standard VA mental health clinics than they did with the HUD-VASH or HCHV programs. It is, thus, possible that receipt of these services outweighed any differences one might have seen between the two case management groups and the standard care group. The availability of mental health services in the VA system may also explain the differnces in findings between this study and those that reported significant clinical improvements with ACT or more intensive case management (Herman et al., 2000; Lehman 1997; Shern et al., 2000).

Vouchers without Case Management?

The findings of this study and others raise the question of whether housing vouchers could be provided to homeless clients without being linked to intensive case management services since access to the vouchers seems to be the most active ingredient in improving housing outcomes. No study or program that we know of has offered vouchers to people with serious mental illness without some special program supports (US Department of Housing and Urban Development, 1995); and consequently no empirical answer to this question is possible. However, the experience of HUD-VASH case managers, and others, suggest that homeless clients with mental illness need assistance negotiating the bureaucratic procedures required to obtain a housing voucher and, even more

important, that landlords appear to be far more willing to accept such clients as tenants when they know that they will be receiving community-based mental health services. There is, however, developing evidence to suggest that case management services might be effectively delivered on a time-limited basis (Rosenheck and Dennis, 2001), as in the Critical Time Intervention (Susser et al., 1997) reducing total health care costs, while assuring access to necessary services and supports.

Cost impact

The cost data reported here show that HUD-VASH resulted in increased costs to VA of $8,009 over three years. From the perspective of society as a whole (including non-health care costs of shelters, jail, administration of transfer programs and earnings) HUD-VASH clients incur $6,200 greater three-year costs than standard care clients, or $2,067 per year.

These findings are quite different from those recently reported from a non-experimental study of homeless mentally ill clients placed in the New York-New York (NY/NY) supported housing program (Culhane et al., 2002). In that study recipients of supported housing services were retrospectively matched with shelter users who did not receive special services and were found to have substantially lower inpatient costs, almost completely offsetting both the clinical and housing expenses of the supported housing program. In particular, the NY/NY study included data from 294 VA patients, who had over $3,000 lower annual inpatient costs than the matched VA controls (Culhane et al., 2002). While HUD-VASH was associated with reduced use of non-VA services, the magnitude of savings was not nearly as large, and VA inpatient costs were not different across the treatment groups (Figure 9).

The major difference between the HUD-VASH and NY/NY studies is that while NY/NY compared service use and costs in statistically matched samples, from the time the experimental group entered housing and a statistically derived time point for controls, HUD-VASH compared service use on the basis of random assignment, from the time vouchers became available to clients all of whom had been determined to be clinically ready for community re-entry. Thus while NY/NY assessed the impact of entering housing in an abstract sense, HUD-VASH assessed the impact of naturalistic entry into a program that provided ready access to Section 8 vouchers.

The major strength of the NY/NY study is that comprehensive administrative data on hospital costs were available from all providers of care, while in the HUD-VASH evaluation administrative

data were only available from the VA system. It is thus possible that standard care clients in the HUD-VASH evaluation, especially those who were not assessed at follow up, incurred far larger non-VA costs than we could document, and that cost savings associated with HUD-VASH were underestimated because of these missing data. However, the absence of any evidence of VA inpatient savings in HUD-VASH still stands in marked contrast to the NY/NY findings, and is probably attributable to the differences in study design, discussed further, below.

It is likely that the matching procedure used in the NY/NY evaluation, based entirely on administrative data, was clinically imperfect and that clients were selected on clinical grounds for NY/NY housing because they had made progress toward recovery from acute psychiatric or addictive problems, and thus were entering a period in their lives when they would have experienced lower hospital use, even without participating in the NY/NY program. For example, across all three groups in the present study, VA inpatient costs declined steadily from the year before entry to through all three years after (Figure 9), primarily because patients were not considered ready for HUD-VASH until their major health problems were stabilized. Patients entering the NY/NY program may have differed from controls in that they were at a different stage of clinical problem resolution, even though they had similar levels of prior service use. The central methodological strength of the HUD-VASH evaluation is that such selection bias is highly unlikely because treatment groups were identified on the basis of random assignment.

Although health care savings in HUD-VASH are smaller than in NY/NY, the net increase in annual costs was just over $2,500 from the VA perspective, $2,321 from the perspective of the total health care system, and $2,067 from the perspective of society, a modest increase considering the substantial improvements in housing status. Cost-effectiveness ratios suggest that, depending on the perspective of the analysis, $45-58 are spent in HUD-VASH for each additional day of housing, although the 95% confidence limits are wide ranging from -$19 to $111.

The increased costs are primarily due to the substantial cost of HUD-VASH case management and other outpatient mental health services (Figure 10). However, as noted above, recent studies have suggested that case management for homeless people with mental illness can be provided on a time-limited basis, when clinically indicated, without loss of effectiveness (Susser et al., 1997; Rosenheck and Dennis, 2001) and in 1997, HUD-VASH policy was changed to allow the

transfer of clients back to standard VA treatment programs after one year of treatment, and only when clinically indicated. This change should substantially lower the costs of HUD-VASH, in the future, without reducing its effectiveness. HUD-VASH was originally designed to follow the ACT model of case management in which service intensity is maintained indefinitely (Stein and Test, 1980) and this may explain why service delivery continued at a high level of intensity at the sites that participated in the experimental evaluation. As implemented at more routine sites, and after the 1997 HUD-VASH policy change, case management costs are likely to be substantially lower than those observed in this clinical trial.

Subgroup analyses

As in any study, it is possible that, while we did not find differences in clinical outcomes for the sample as a whole, certain subgroups may have derived clinical or other benefits from HUD-VASH. We conducted secondary subgroup analyses of veterans: i) with severe mental illness, ii) dually diagnosed with both psychiatric and substance abuse disorders, iii) who had been homeless for over one year at the time of program entry, iv) who were members of racial/ethnocultural minority groups, and v) with and low levels of social support at the time of program entry. Results of these analyses were not different from the analyses of the entire sample.

Nor were results different in a set of analyses that excluded "crossovers", i.e., veterans in the voucher plus case management group who did not receive a voucher, veterans in the other groups who did receive a voucher, and veterans in the case management-only group who did not participate in case management for at least 6 months.

Furthermore, separate analyses of data from individual sites also showed no different results from the analyses from the entire sample, although differences in housing outcomes were most robust at the sites with least attrition of standard care subjects from follow-up assessments, confirming our view that the differential attrition from the follow-up biased our results against the experimental groups.

Limitations

The principle limitation of this study is the substantial and differential follow-up attrition across treatment groups. It is somewhat reassuring that there were few differences at baseline between those who were successfully followed up and those who were not, and that results did not

change when analyzed using marginal structural models (Robins and Finkelstein, 2000). However, survival analysis showed, not surprisingly, that being housed at a given point in time was one of the main predictors of completing subsequent follow-up interviews, and thus subjects in the two experimental conditions were more likely to be reinterviewed than those in standard care. Since one would expect that veterans who were doing less well clinically, especially those who had relapsed to substance abuse, would be less likely to stay in treatment and more likely to be lost to follow-up, these selection biases may falsely improve the apparent outcomes in the standard care group, thus masking possible differences in housing and clinical status that might have further favored HUD-VASH. In view of this limitation, the negative findings for clinical outcomes should be interpreted cautiously.

In addition, the substantial missing data, especially in the 3rd year of data collection leave us with increased uncertainty about the accuracy of our outcome and cost data, especially as pertains to non-VA costs. Because we use imputed figures as real values in computing cost-effectiveness ratios their uncertainty is underestimated.

Finally, since this study was conducted within in the VA health care system, the generalizability of the findings to samples with larger proportions of women, or to health care systems other than VA is uncertain. Other studies, however, have shown few clinically important differences between veterans and other homeless men (Rosenheck and Koegel, 1994; Tessler, Rosenheck, and Gamache, in press) or between the outcomes of VA and non-VA homeless outreach programs (Kasprow et al., 2002).

Policy Implications

To avoid any misunderstanding, it should be emphasized that our findings should not be taken to suggest that case management, in general, does not result in improved health status or community adjustment for homeless people with mental illness. This study compared two case management interventions to standard care in a health care system in which homeless veterans had an outreach clinician to link them with a full range of health care services, at least in the short run. Housing outcomes, in fact, were quite impressive even for the standard care group (Figures 2 and 3). To evaluate case management and clinical services for homeless people with mental illness in an absolute sense, one would have to compare outcomes for recipients of those services with outcomes

for clients who were kept from using any such services at all. Such a study would be inhumane, unethical, and illegal.

While system-wide efforts to improve client outcomes by fostering services integration across entire service systems have been ineffective (Rosenheck et al., in press), the agency-specific approach demonstrated here was successful at both integrating clinical and housing services and in improving housing although not clinical outcomes, at modestly increased cost. Our findings clearly demonstrate the benefits of housing vouchers for this population and suggest that health-care costs of program such as HUD-VASH may be reduced by reducing the intensity and duration of case management.

Section 8 housing vouchers, whose value to homeless people with mental illness is clearly demonstrated by this study are in extremely short supply, with long waiting lists in most cities. While expanding the availability of vouchers would increase government spending, a major political hurdle, this study clearly demonstrates their effectiveness, when linked with case management services, at improving the circumstances of homeless people with serious mental illness.

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Figure 1. Follow-up Rates in the HUD-VA Supported Housing Program:Percentage of Veterans Interiewd

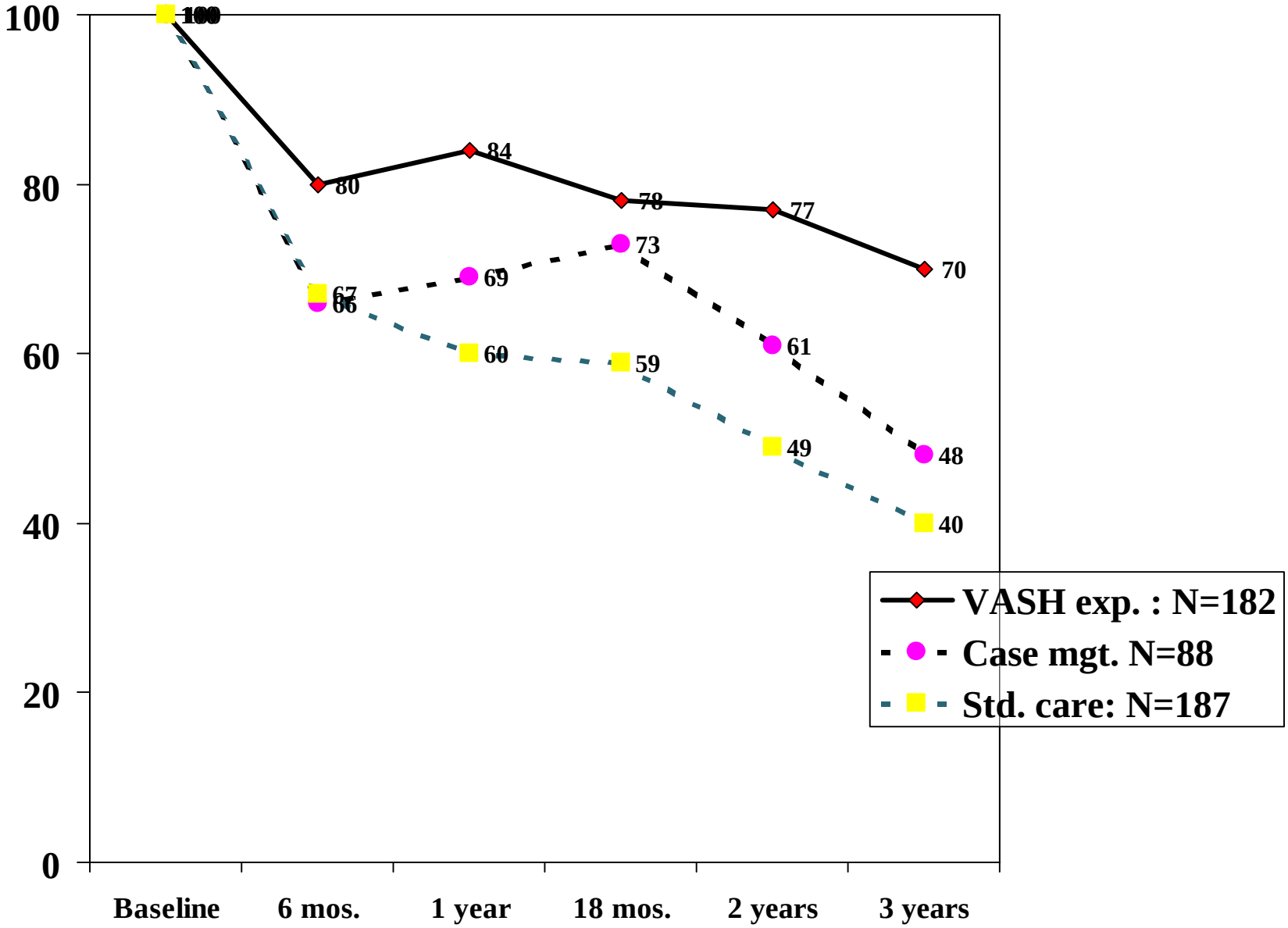
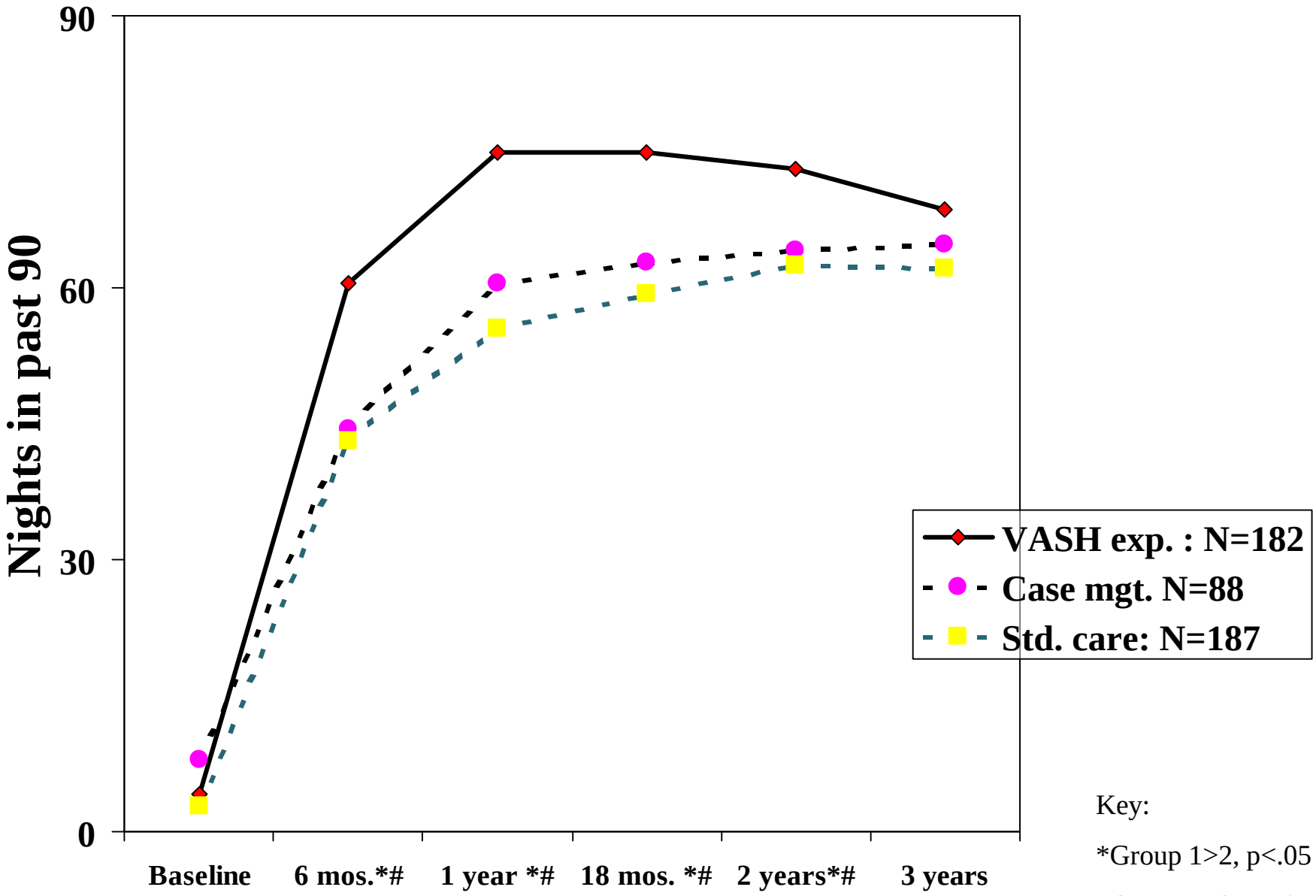


Figure 2. Outcomes in the HUD-VA Supported Housing Program: Nights Housed in Past 90

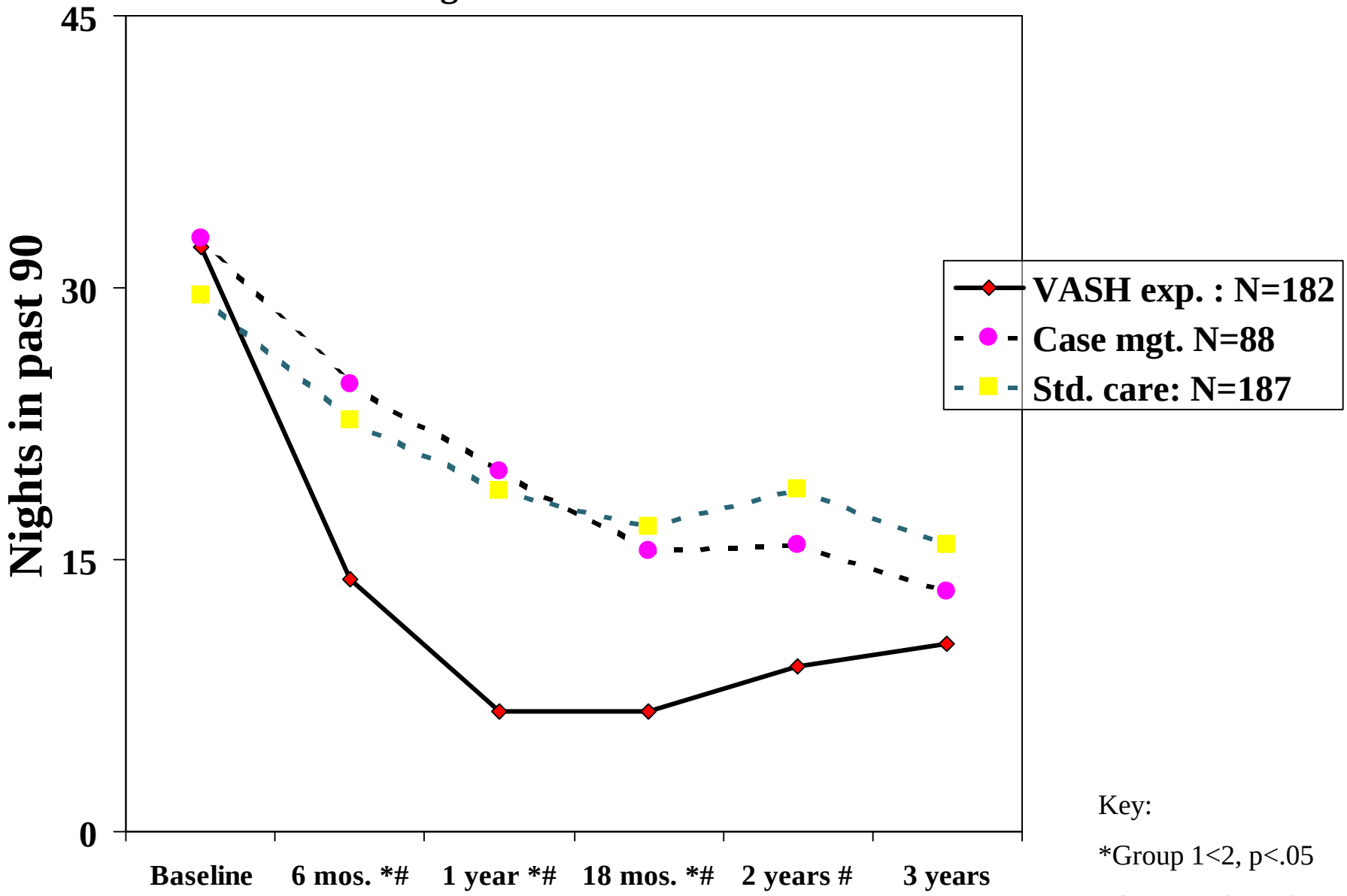


Key:

*Group 1>2, p<.05

#Group 1>3, p<.05

Figure 3. Outcomes in the HUD-VA Supported Housing Program: Nights Homeless in Past 90

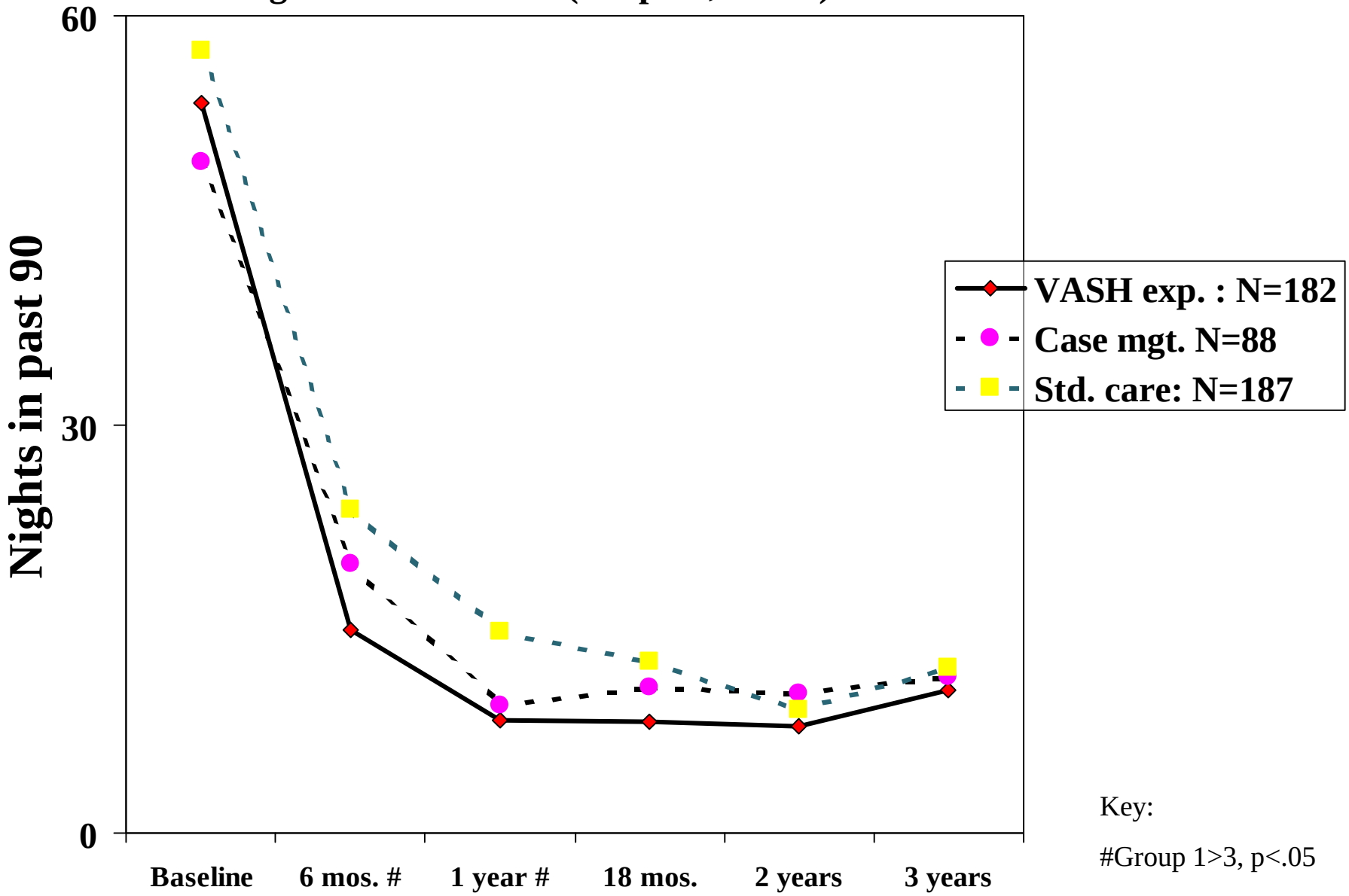


Key:

*Group 1<2, p<.05

#Group 1<3, p<.05

Figure 4. Outcomes in the HUD-VA Supported Housing Program: Nights in Institutions (Hospital, HWH) in Past 90



Key:

#Group 1>3, p<.05

Figure 5. Outcomes in the HUD-VA Supported Housing Program: Alcohol Problems (ASI composite score)

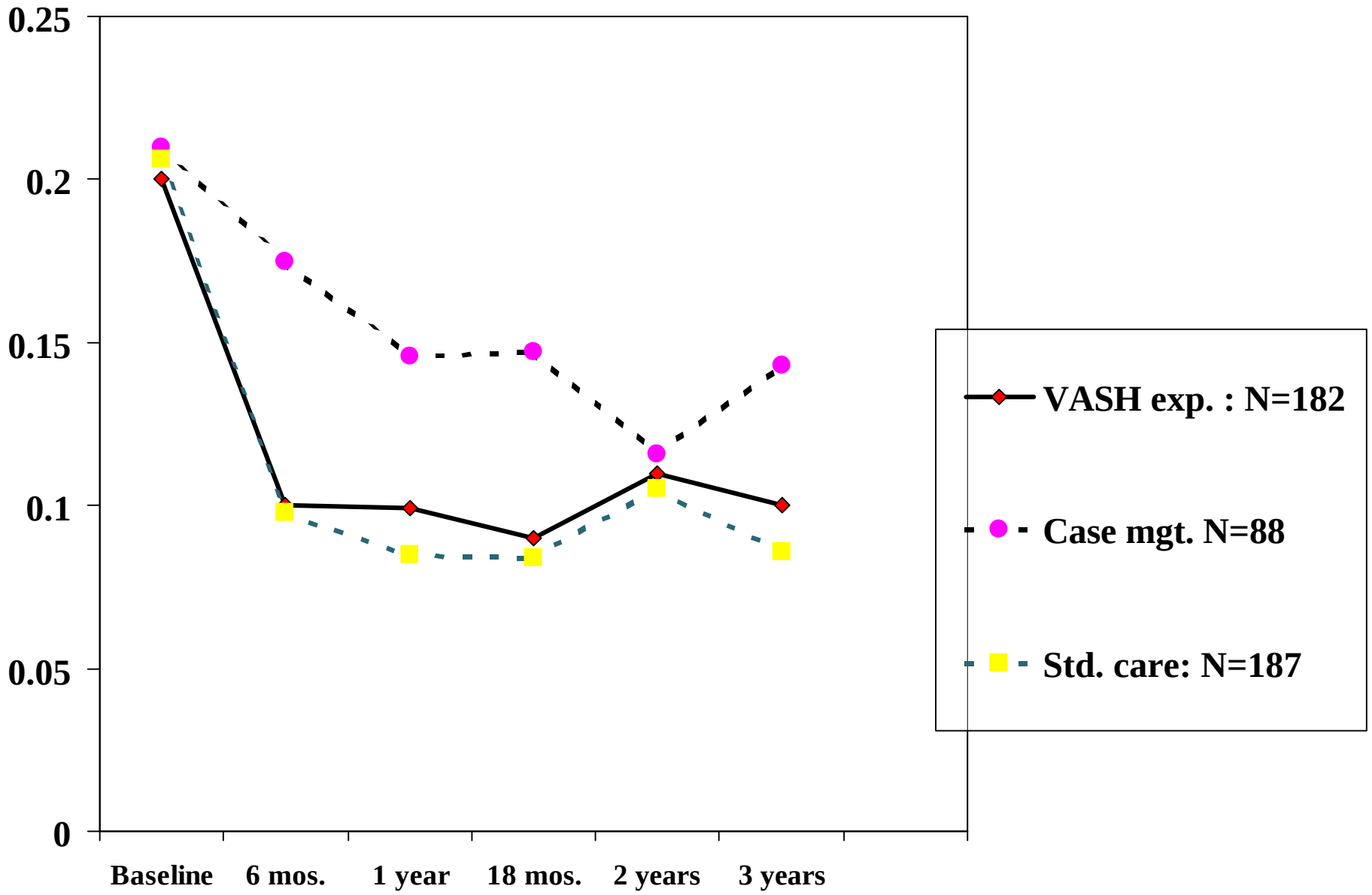


Figure 6. Outcomes in the HUD-VA Supported Housing Program: Drug Problems (ASI composite score)

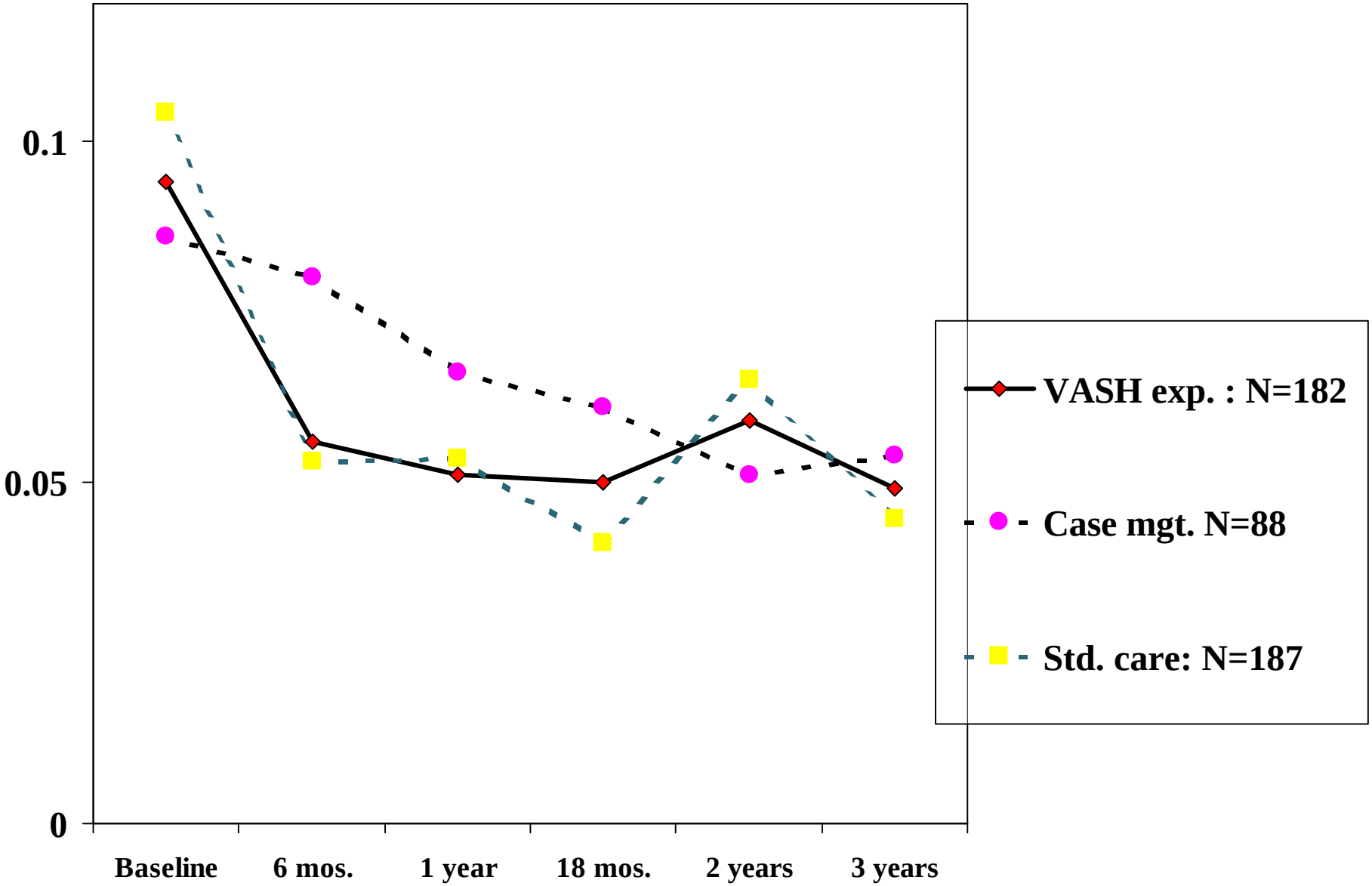


Figure 7. Outcomes in the HUD-VA Supported Housing Program: Psychological Distress (BSI global severity index)

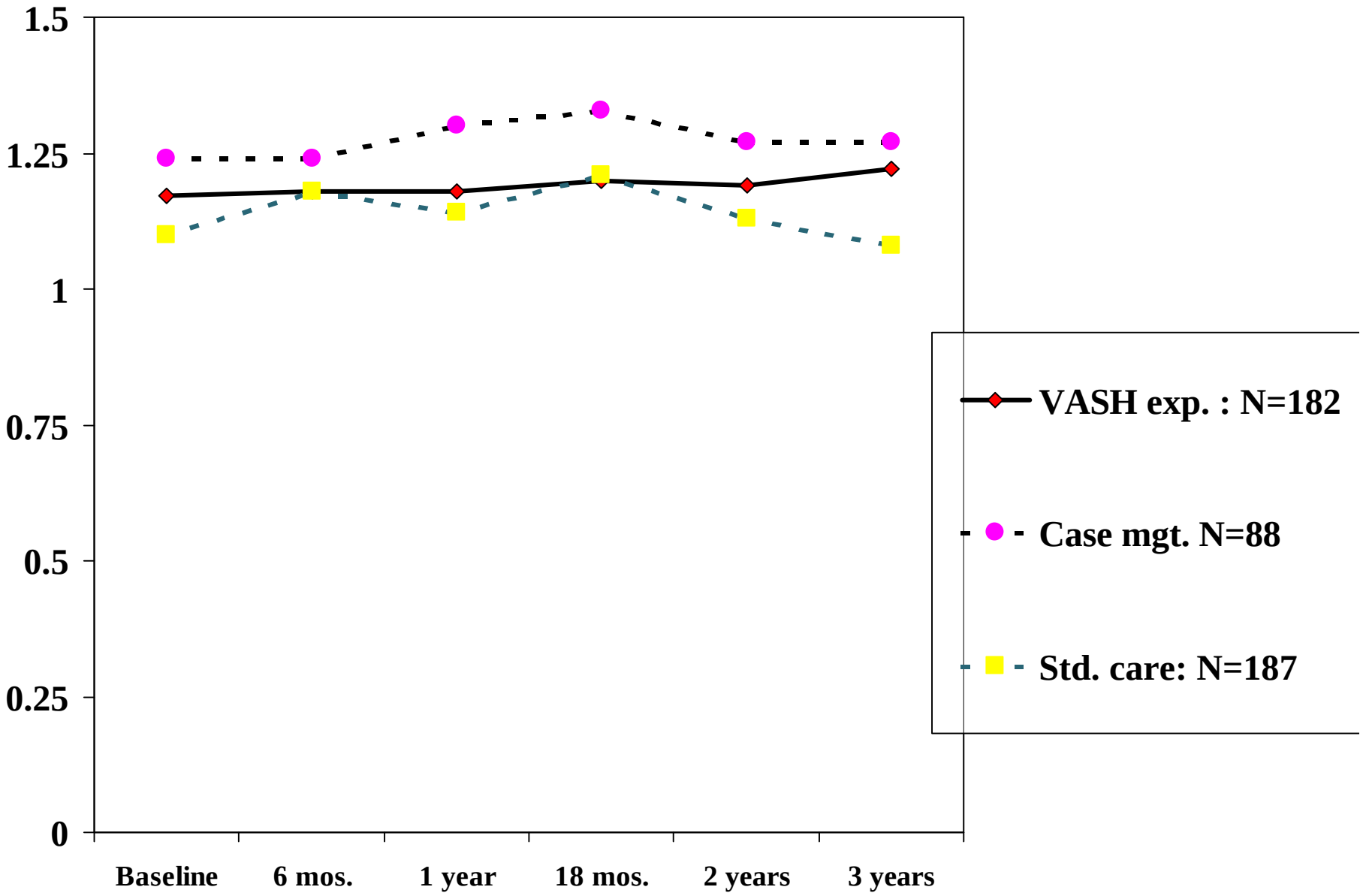
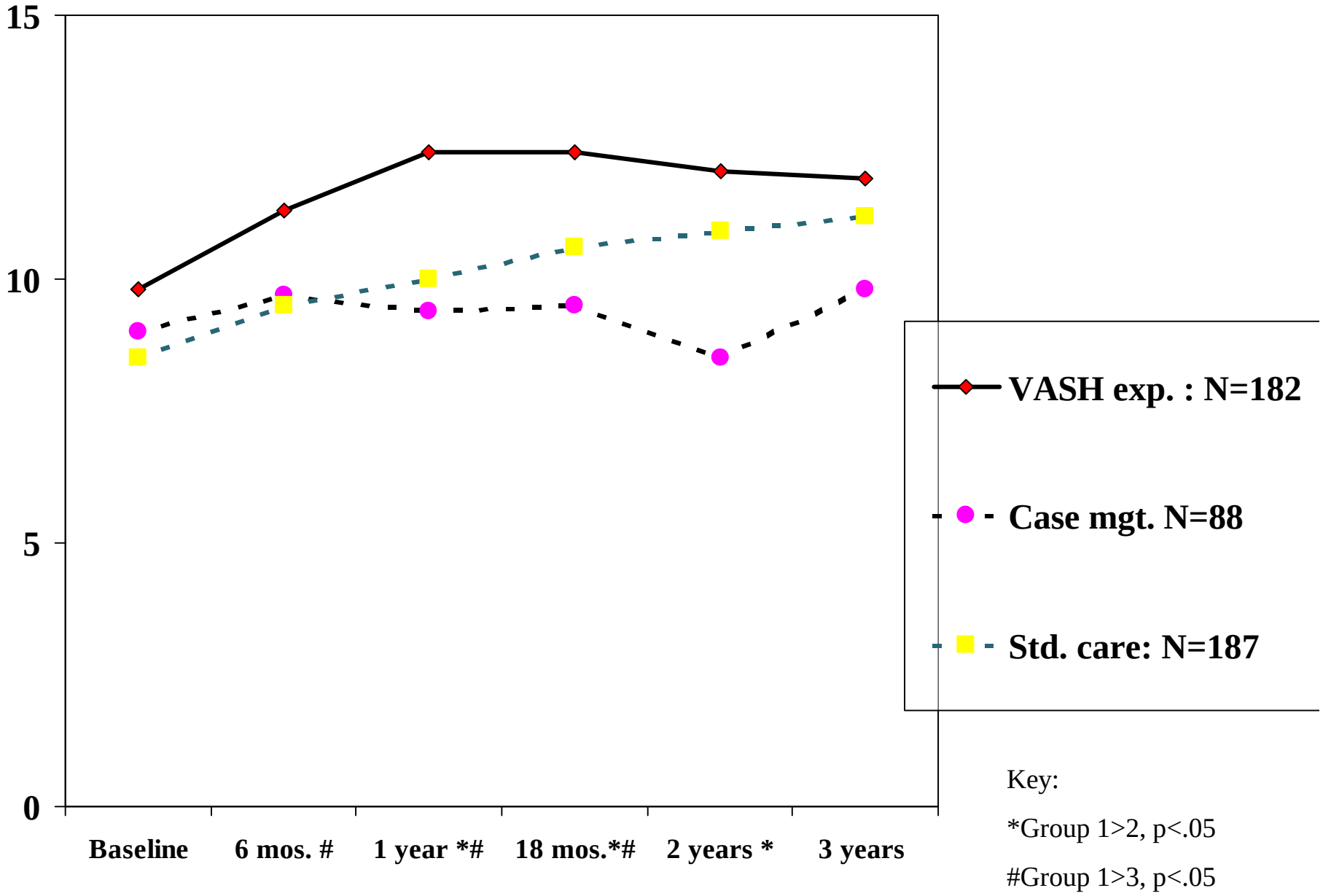


Figure 8. Outcomes in the HUD-VA Supported Housing Program: Social Network Size (number of people feel close to).

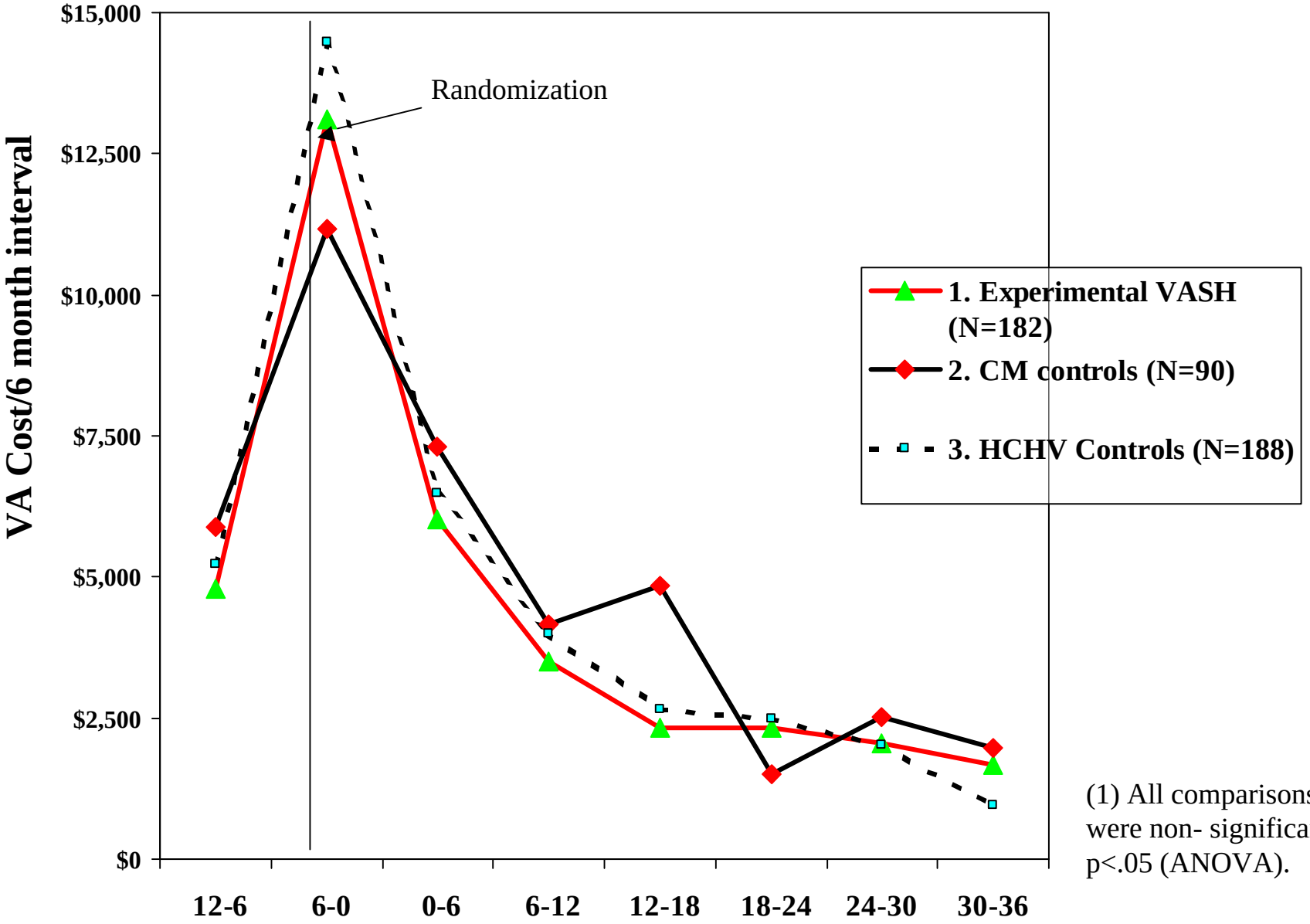


Key:

*Group 1>2, p<.05

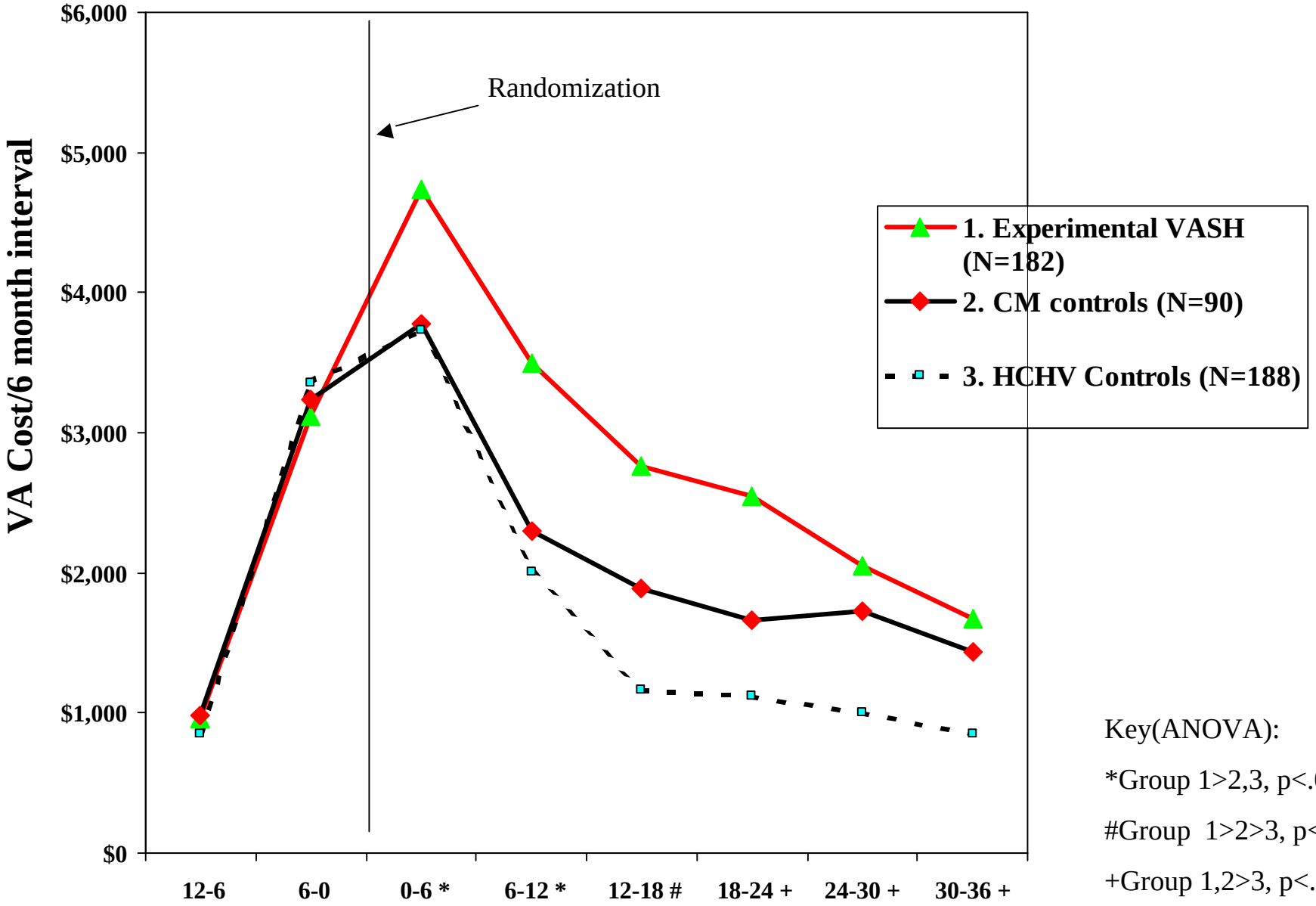
#Group 1>3, p<.05

Figure 9. VA inpatient and residential treatment costs one year before and three years after randomization, by 6-month interval (1).



(1) All comparisons were non- significant at p<.05 (ANOVA).

Figure 10. Total VA outpatient costs one year before and three years after randomization, by 6-month intervals.



Key(ANOVA):

*Group 1>2,3, p<.05

#Group 1>2>3, p<.05

+Group 1,2>3, p<.05

Table 1. Baseline comparison of experimental groups.

	Total N=460	Group 1 HUD-VASH N=182	Group 2 CM-only N=90	Group 3 Standard Care N=188	Chi sq/F	p
Sociodemographic Characteristics						
Mean Age	42.0	41.2	42.9	42.5	2.04	0.13
Male	96.1%	96.7%	92.1%	97.3%	4.7	0.09
Race/Ethnicity					2.6	0.99
White	32.1%	31.2%	30.7%	33.7%		
Black	63.0%	63.6%	65.9%	60.9%		
Hispanic	3.5%	4.0%	2.3%	3.6%		
Other	1.4%	1.2%	1.1%	1.8%		
Marital status					4.54	0.80
Married	5.3%	4.4%	4.6%	6.5%		
Widowed	2.0%	2.2%	2.3%	1.6%		
Separated	16.5%	17.8%	19.3%	14.0%		
Divorced	42.3%	38.3%	43.2%	45.7%		
Never Married	33.9%	37.2%	30.7%	32.3%		
Mean Income	$443	$430	$487	$435	0.37	0.69
Receives Public Support	57.6%	58.8%	61.4%	54.6%	1.32	0.51
VA Benefits	38.5%	29.4%	50.0%	42.9%	1.15	0.56
Housing						
Days Homeless, Past 30	25.1	25.5	23.6	25.5	1.47	0.23
Duration of Homeless Episode					13.16	0.11
Not literally homeless	1.2%	0.6%	0.0%	2.4%		
< 6 months	43.0%	43.8%	43.2%	42.0%		
6 months - 1 year	17.8%	18.8%	11.4%	20.1%		
1-2 years	11.1%	13.1%	15.9%	6.5%		
> 2 years	27.0%	23.9%	29.6%	29.0%		
In residential treatment at referral	69.4%	69.1%	60.9%	74.1%	4.737	0.09
Clinical Status						
Serious Psychiatric Disorder	44.6%	41.7%	47.7%	46.0%	1.12	0.57
Psychiatric Index (ASI)	0.25	0.25	0.27	0.25	0.36	0.70
Substance Abuse	87.5%	85.6%	89.8%	88.2%	1.13	0.57
Days Intoxicated in Past 30	5.1	4.7	4.1	5.8	1.34	0.27
Days Used Drugs in past 30	6.3	6.0	6.9	6.3	0.25	0.78
Alcohol Index (ASI)	0.21	0.20	0.20	0.21	0.11	0.90
Drug Index (ASI)	0.10	0.10	0.09	0.10	0.62	0.54
Expenditure on Substances, past 30 d	$239	$202	$265	$262	0.71	0.49
Medical problems	45.1%	43.8%	53.5%	42.4%	3.1	0.21
Medical Problem Index (ASI)	0.40	0.41	0.45	0.38	0.90	0.41
Used VA in past 6 months	47.1%	46.1%	46.6%	48.4%	0.203	0.90
Thoughts of Suicide	21.2%	16.5%	25.0%	24.1%	4.09	0.13
Attempted Suicide (past 30 days)	3.3%	3.3%	4.6%	2.7%	0.69	0.71
Clinical Diagnoses						
Alcohol abuse/dependency	65.4%	66.1%	64.8%	65.1%	0.1	0.97
Drug abuse/dependency	67.3%	68.9%	64.8%	66.9%	0.5	0.78
Schizophrenia	5.3%	5.8%	5.7%	4.7%	0.2	0.91
Other psychosis	2.6%	1.7%	4.6%	2.4%	1.9	0.38
Bipolar Disorder	3.7%	4.6%	4.6%	2.4%	1.4	0.49
Depressive Disorder	28.5%	29.3%	28.4%	27.8%	0.1	0.95
PTSD	14.4%	14.9%	15.9%	13.0%	0.5	0.79
Other anxiety disorder	6.8%	3.1%	24.1%	44.8%	1.1	0.56
Any substance abuse	85.6%	89.8%	87.7%	87.3%	0.9	0.63
Any serious psychiatric disorder	44.9%	40.8%	48.9%	47.1%	2.1	0.36
Dually diagnosed	35.2%	31.1%	37.5%	38.0%	2.15	0.34
Community Adjustment						
Usually Employed Past 3 Years	34.4%	34.6%	28.9%	36.7%	1.65	0.44
Days worked for pay in past 30	2.1	2.1	1.4	2.4	0.84	0.43
Employment Index (ASI)	0.14	0.14	0.15	0.14	0.20	0.81
Legal Problem Index (ASI)	0.07	0.05	0.06	0.08	0.97	0.38
Social Network People	9.26	9.78	9.09	8.85	0.59	0.55
Social Network Contacts	27.72	29.84	23.89	27.55	1.23	0.29
Social Support	6.98	6.96	7.14	6.92	0.67	0.51
Arrests in Past 30 days: Major Crimes	1.24	1.27	1.17	1.23	0.11	0.89
Arrests in Past 30 days: Minor Crimes	1.15	1.23	1.00	1.12	0.79	0.45
Childhood History						
Antisocial Behavior (Helzer)	1.93	1.98	2.34	1.82	1.58	0.21
Family Instability	4.52	4.43	4.58	4.57	0.17	0.85
Mode of First Contact					20.60	0.12
VA Community Outreach	41.5%	43.7%	43.7%	38.2%		
Referreal from Non-VA Homeless Pgm	8.5%	6.9%	10.3%	9.4%		
Referral from VA program	19.0%	18.6%	18.4%	20.0%		
Self-referred	22.7%	19.0%	25.3%	25.3%		
Other	8.1%	12.1%	2.3%	7.6%		

Table 2. Comparison of treatment process across groups.

	Group 1 HUD-VASH N=182	Group 2 CM-only N=90	Group 3 Standard Care N=188	F/ Chi sq.	df	p	Paired comparison (p<0.05)
I. VASH Program Contact							
Any Clinical Contacts (1)							
Year 1	95.6%	95.6%	85.6%	19.36	2	**p<.0001**	
Year 2	85.6%	80.0%	67.0%	18.85	2	**p<.0001**	
Year 3	80.8%	71.1%	49.5%	55.96	2	**p<.0001**	
Number of contacts (2)							
Year 1	34.2	22.0	6.8	71.07	2,418	**p<.0001**	1>2>3
Year 2	22.1	16.2	5.2	47.33	2,356	**p<.0001**	1>2>3
Year 3	16.3	13.9	6.4	12.65	2,301	**p<.0001**	1,2 >3
Duration of Invovlement (years)(3)	2.40	2.08	0.69	145.88	2,395	**p<.0001**	1>2>3
II. Therapeutic Aliance (4)							
Clinician rating							
Year 1	4.29	3.92	3.99	13.59	2,1244	**p<.0001**	1>2,3
Year 2	4.06	3.79	3.93	3.57	2,698	**0.03**	1>2
Year 3	4.25	3.75	3.87	12.42	2,715	**p<.0001**	1>2
Client rating							
Year 1	4.71	4.43	4.28	10.74	2,991	**p<.0001**	1>2,3
Year 2	4.73	4.52	4.52	1.71	2,470	0.18	
Year 3	4.21	4.35	4.60	0.37	2,346	0.69	
III. Initial HUD-VASH Housing Search							
Obtained Section 8 Voucher	78.6%	5.6%	1.6%	288.65	2	**p<.0001**	
Months to obtain voucher (5)	3.03	12.03	20.87	39.12	2	**p<.0001**	
Client and CM met with landlord (6)	71.6%	N/A	N/A				
Number of apartments visited by client (6)	4.20	N/A	N/A				
CM helped furninsh apartment (6)	54.1%	N/A	N/A				
IV. Case Management Activities (first year) (7)							
Days from randomization to community entry (sd)	80.1	78.1	68.2	0.76	2,406	0.46	
Helped find employment	16.9%	6.9%	15.2%	17.9	2	**p<.0001**	
Helped access income	17.2%	12.9%	19.4%	4.3	2	0.11	
Helped locate apartment	25.4%	21.1%	8.9%	24.4	2	**p<.0001**	
Helpd obtain or keep housing	53.5%	48.4%	31.4%	30.1	2	**p<.0001**	
Helped negotiate with landlord	33.7%	17.2%	5.2%	79.6	2	**p<.0001**	
Helped move into apartment	11.7%	6.6%	3.1%	16.7	2	**p<.001**	
Helped furnish apartment	26.4%	20.8%	5.2%	40.3	2	**p<.0001**	
Provided rehabilitation services	52.4%	52.3%	43.3%	5.5	2	0.06	
Provided substance abuse services	51.9%	52.3%	38.1%	12.6	2	**p<.002**	
Provided psychotherapy	27.7%	23.7%	19.6%	6.007	2	**p<.05**	
V. Reasons for Termination (8)							
Lost housing voucher	31.0%	5.1%	1.4%	51.24	2	**p<.0001**	
Substance abuse relapse	50.0%	45.9%	20.9%	25.01	2	**p<.0001**	
Did not tolerate closeness of case management	47.5%	57.4%	10.5%	59.34	2	**p<.0001**	
Left to purusure treatment elsewhere	12.1%	21.3%	7.7%	7.58	2	**p<.03**	
Veteran accomplished goal of limited improvement.	24.5%	14.0%	29.2%	5.02	2	p=.08	
Significant improvement	24.7%	23.3%	33.1%	2.93		0.23	
VI. VA mental health visits (non-VASH or HCHV)(9)							
Year 1	68.5	51.3	65.1	1.72	2,458	0.18	
Year 2	43.4	26.6	22.6	5.71	2,458	**0.004**	1>2,3
Year 3	29.7	23.2	17.5	2.73	2,458	0.06	

(1) Contact with specialized VA homeless programs (HUD-VASH or HCHV)(based on computerized administrative workload data).
(2) Average number of contacts among those with any contacts.
(3) Years from randomization to last contact documented on case manager clinical summary up to 3 years after randomization.
(4) Average score on five items, scored on a 0-6 scale.
(5) Median number of months from randomization to obtaining voucher among those who obtained a voucher.
(6) Sample limited to clients who found housing using allocated voucher: N= 143 (group 1)(N/A = not applicable).
(7) Based on quarterly case management reports completed during the first year (most reports followed initial housing search and reflect subsequent case management activitiy): N=768 (group 1); 303 (group 2); 191 (group 3).
(8) Reason for discharge according to case manager's assessment among those discharged (can be more than one): N= 98, 57, 143, respectively.
(9) Other outpatient VA psychiatric or substance abuse services (based on computerized administrative workload data).

Table 3. Mean values of outcome measures across all time points: HUD VASH program.

	Group 1 HUD-VASH N=182	Group 2 CM-only N=90	Group 3 Standard Care N=188	Significance of Differences (1) t (1 vs 2)	p	t (1 vs 3)	p	t (2 vs 3)	p
I. Housing									
Days housed	59.39	50.81	47.6	2.90	**p<.004**	4.88	**p<.0001**	1.06	0.29
Days homeless	13.05	20.33	20.45	2.87	**0.004**	3.56	**0.0004**	0.05	0.96
Days in institutions	17.25	18.51	21.64	0.58	0.56	2.46	**0.01**	1.40	0.16
Subjective QOL: Housing	4.48	4.02	4.12	4.4	**p<0.0001**	4.27	**p<0.0001**	0.90	0.37
Housing Problems	0.34	0.46	0.45	2.99	**0.003**	3.48	**0.0005**	0.12	0.91
Housing Quality	0.66	0.63	0.61	1.52	0.13	2.53	**0.01**	0.54	0.59
II. Clinical Status									
Days Drank to Intox.	1.46	1.95	1.71	1.17	0.24	0.73	0.46	0.55	0.58
Days Worked past 30	6.96	6.82	6.71	0.17	0.87	0.36	0.71	0.13	0.89
Alcohol index (ASI)	0.12	0.151	0.121	1.9	0.06	0.34	0.73	1.59	0.11
Drug index (ASI)	0.061	0.065	0.063	0.44	0.66	0.21	0.83	0.26	0.79
Psychiatric Index (ASI)	0.25	0.26	0.24	0.69	0.49	0.34	0.73	0.95	0.34
Psychological Distress (BSI)	1.2	1.29	1.16	0.96	0.34	0.47	0.64	1.33	0.18
Medical Index (ASI)	0.26	0.28	0.27	0.47	0.63	0.39	0.69	0.15	0.88
III. Community Adjustment									
Employment index (ASI)	0.191	0.187	0.187	0.17	0.86	0.2	0.84	0.01	0.99
Legal Index (ASI)	0.061	0.063	0.087	0.14	0.89	1.92	0.06	1.36	0.17
Total Income	$656	$684	$717	0.59	0.55	1.56	0.12	0.67	0.50
Expenditures on SA	$75	$96	$77	1.01	0.31	0.1	0.92	0.89	0.37
Social Network Size	11.6	9.3	10.1	2.52	**0.01**	2.02	**0.04**	0.88	0.38
Social Contact	39.1	30.4	36.5	2.5	**0.01**	0.91	0.36	1.74	0.08
Social Support	7.85	6.54	7.11	2.65	**0.008**	1.83	0.07	1.15	0.25
Subjective QOL: Overall	4.31	3.92	4.18	2.64	**0.009**	1.09	0.28	1.73	0.08
Subjective QOL: Family	4.49	4.16	4.25	2.28	**0.02**	2.02	**0.04**	0.62	0.53
Subjective QOL:Finances	3.26	2.93	3.12	2.5	**0.01**	1.31	0.19	1.41	0.16
Subjective QOL:Health	4.5	4.18	4.36	2.87	**0.004**	1.54	0.125	1.60	0.11
Subjective QOL:Social Rels.	4.31	4.04	4.2	2.42	**0.02**	1.25	0.21	1.38	0.17
Arrests: Major Crimes	0.23	0.2	0.23	0.79	0.43	0.1	0.92	0.82	0.41
Arrests: Minor Crimes	0.22	0.21	0.22	0.46	0.64	0.22	0.82	0.27	0.79

(1) Differences in least square means in repeated measures mixed models using Proc Mixed of SAS (R) Version 8.0.

Table 4. VA treatment costs over three years.

	Group 1 HUD-VASH N=182	Group 2 CM-only N=90	Group 3 Standard Care N=188	F (1)	p	Paired comparison (p<0.05)
Total VA health care costs.	$36,524	$35,095	$28,515	2.8	0.06	1>3
Outpatient care	$17,267	$12,779	$9,886	16.89	**p<.0001**	1>2,3
Outpatient mental health care	$10,183	$7,253	$7,729	3.2	**0.04**	1>2,3
Outpatient medical-surgical care	$1,544	$1,784	$1,522	0.83	0.44	
Homeless case management (2)	$5,539	$3,741	$634	104.89	**p<.0001**	1>2>3
Inpatient and residential care	$19,257	$22,315	$18,628	0.45	0.64	
Inpatient mental health care	$12,023	$12,045	$9,318	0.72	0.49	
Inpatient medical-surgical care	$4,043	$5,071	$4,824	0.16	0.85	
Residential care (3)	$3,291	$5,199	$4,486	1.62	0.20	

(1) df for all models are 2,458.

(2) Case management contacts with either HUD-VASH of HCHV staff.

(3) Including VA residential and domiciliary care and non-VA care funded through VA contracts.

Table 5. Non-VA and total societal costs over three years (1).

	Group 1 HUD-VASH N=182	Group 2 CM-only N=90	Group 3 Standard Care N=188	F (1)	p	Paired comparison (p<0.05)
Non-VA Costs						
Non-VA Health Costs	$9,725	$7,304	$10,772	1.08	0.34	
Mental health	$4,627	$5,035	$6,163	0.95	0.39	
Non-mental health	$5,098	$2,269	$4,609	1.25	0.29	
Non-Health Costs	$867	$2,017	$1,629	0.51	0.60	
Shelter	$2,375	$3,316	$4,774	5.31	**0.01**	1<3
Incarceration	$1,062	$1,305	$758	0.65	0.52	
Administrative Costs of Transfer Payments (excluding voucher)	$380	$413	$389	0.27	0.76	
Administrative Cost of Section 8 Vouchers (2)	$967	$40	$4	192.40	**0.0001**	1<2,3
Earned Income (productivity)(3)	($3,917)	($3,057)	($4,296)	2.70	0.07	2<3
Combined VA and non-VA Costs						
VA Health Costs (from Table 4)	$36,524	$35,095	$28,515	2.74	0.07	
Total health Costs (VA and non-VA)	$46,249	$42,399	$39,287	1.40	0.25	
Total Societal Cost (4)	$47,116	$44,416	$40,916	1.03	0.36	
Incremental cost of HUD-VASH (difference between groups)	$6,200	$3,500				
Annualized incremental cost	$2,067	$1,167				

(1) Estimated on the basis of regression model using available interview data on non-VA health and non-heath resource use.
(2) Based on PHA and HUD administrative costs and duration of possession of voucher, averaged over all participants, not just those who received a Section 8 Voucher)
(3) Productivity (earned income) increases societal resources and thus is considered a negative cost.
(4) Sum of VA Health costs, non VA health and non-hea;th costs.

Table 6. Baseline comparisons: Experimental group vs. observational outcome study.

	Total N=1106	Exerimental HUD-VASH N=182	Observational Sample N=976	Chi sq/F	p
Sociodemographic Characteristics					
Mean Age	43.0	41.2	43.3	11.29	**0.0008**
Male	95.5%	96.7%	95.2%	0.75	0.39
Race/Ethnicity				26.35	**0.001**
White	45.7%	31.2%	49.6%		
Black	46.8%	63.6%	42.3%		
Hispanic	5.2%	4.0%	5.5%		
Other	2.3%	1.2%	2.6%		
Marital status				2.87	0.72
Married	4.5%	4.4%	4.5%		
Widowed	2.5%	2.2%	2.6%		
Separated	17.4%	17.8%	17.3%		
Divorced	43.1%	38.3%	44.0%		
Never Married	32.5%	37.2%	31.6%		
Mean Income	$407	$431	$402	0.59	0.44
Receives Public Support	50.8%	58.8%	49.3%	5.48	**0.02**
VA Benefits	55.7%	29.4%	59.3%	5.42	**0.02**
Days Homeless, Past 30	24.6	25.5	24.4	1.49	0.22
Duration of Homeless Episode					
Not literally homeless	2.2%	0.6%	2.6%	3.68	0.60
< 6 months	41.5%	43.8%	40.9%		
6 months - 1 year	18.2%	18.8%	18.1%		
1-2 years	12.6%	13.1%	12.5%		
> 2 years	25.3%	24.9%	25.7%		
In residential treatment at referral	58.1%	69.1%	55.1%	11.15	**0.001**
Health Status					
Serious Psychiatric Disorder	51.8%	41.7%	53.8%	8.84	**0.003**
Psychiatric Index (ASI)	0.24	0.25	0.23	0.66	0.42
Substance Abuse	80.2%	85.6%	79.2%	3.86	**0.05**
Days Intoxicated in Past 30	3.5	4.7	3.3	4.72	**0.03**
Days Used Drugs in past 30	3.2	6.0	2.6	29.00	**0.0001**
Alcohol Index (ASI)	0.17	0.20	0.17	3.36	0.07
Drug Index (ASI)	0.07	0.10	0.06	16.48	**0.0001**
Expenditure on Substances, past 30 days	$179	$202	$174	0.40	0.52
Medical problems	47.5%	43.8%	48.2%	1.14	0.28
Medical Problem Index (ASI)	0.35	0.41	0.34	5.01	**0.03**
Used VA in past 6 months	55.4%	46.1%	57.2%	7.52	**0.01**
Thoughts of Suicide	17.5%	16.5%	17.7%	0.151	0.70
Attempted Suicide (past 30 days)	3.4%	3.3%	3.4%	0.002	0.96
Clinical Diagnoses					
Alcohol abuse/dependency	67.7%	66.1%	68.1%	0.25	0.62
Drug abuse/dependency	50.4%	69.0%	45.6%	30.1	**0.001**
Schizophrenia	8.9%	5.8%	9.7%	2.68	0.10
Other psychosis	2.9%	1.7%	3.2%	1.06	0.30
Bipolar Disorder	4.9%	4.6%	5.0%	0.051	0.82
Depressive Disorder	34.4%	29.3%	35.7%	2.5	0.11
PTSD	16.2%	14.9%	16.6%	0.267	0.61
Other anxiety disorder	8.1%	5.2%	9.0%	2.64	0.10
Any substance abuse	78.6%	85.6%	76.8%	6.45	**0.01**
Any serious psychiatric disorder	52.5%	40.8%	55.6%	12.11	**0.001**
Dually diagnosed	36.5%	31.1%	37.5%	2.67	0.102
Community Adjustment					
Usually Employed Past 3 Years	44.1%	34.6%	45.8%	7.79	**0.01**
Days worked for pay in past 30	3.1	2.1	3.3	4.74	**0.03**
Employment Index (ASI)	0.18	0.14	0.18	5.07	**0.02**
Legal Problem Index (ASI)	0.06	0.05	0.06	0.44	0.51
Social Network People	9.85	9.78	9.87	0.02	0.89
Social Network Contacts	29.63	29.84	29.59	0.01	0.92
Social Support	7.76	6.90	7.92	5.39	**0.02**
Arrests in Past 30 days: Major Crimes	1.08	1.27	1.04	4.13	**0.04**
Arrests in Past 30 days: Minor Crimes	1.20	1.23	1.19	0.14	0.71
Childhood History					
Antisocial Behavior (Helzer)	1.98	1.99	1.99	0.00	0.98
Family Instability	4.49	4.44	4.51	0.11	0.74
Mode of First Contact				32.70	**0.001**
VA Community Outreach	49.0%	43.7%	50.5%		
Referreal from Non-VA Homeless Pgm	8.9%	6.9%	9.4%		
Referral from VA program	17.0%	18.4%	16.6%		
Self-referred	19.7%	19.0%	19.9%		
Other	5.4%	12.1%	3.7%		

Table 7. Comparison of treatment process across groups.

	Exerimental HUD-VASH N=182	Observational Sample N=976	F/ Chi sq.	df	p
I. VASH Program Contact					
Any Clinical Contacts (1,2)					
Year 1	96.7%	97.4%	3.91	1	0.06
Year 2	88.5%	69.5%	27.58	1	**p<.0001**
Number of contacts (2,3)					
Year 1	33.6	32.3	0.39	1,1074	0.53
Year 2	22.0	24.7	2.18	1,839	0.14
Duration of Invovlement (years)(4)	1.73	1.49	18.65	1,1000	**p<.0001**
II. Therapeutic Aliance (5)					
Clinician rating					
Year 1	4.29	4.31	0.18	1,3673	0.67
Year 2	4.06	4.26	12.46	1,1211	**0.0003**
Client rating					
Year 1	4.71	4.83	5.57	1,1848	**0.02**
Year 2	4.73	4.77	3.39	1,513	0.07
III. Initial HUD-VASH Housing Search					
Obtained Section 8 Voucher (2)	84.6%	62.3%	33.63	1	**p<.0001**
Months to obtain voucher (6)	3.10	3.07	0.55	1	0.45
Client and CM met with landlord (7)	71.6%	68.3%	0.56	1	0.45
Number of apartments visited by client (7)	4.28	4.17	0.08	1.697	0.77
CM helped furninsh apartment (7)	54.1%	68.0%	9.08	1	**0.003**
IV. Case Management Activities (first year) (8)					
Helped find employment	16.9%	12.2%	12.3	1	**0.0005**
Helped access income	17.2%	22.7%	11.1	1	**0.0008**
Helped locate apartment	25.4%	19.7%	12.2	1	**0.0005**
Helpd obtain or keep housing	53.5%	44.1%	21.5	1	**p<.0001**
Helped negotiate with landlord	33.7%	30.1%	3.7	1	0.06
Helped move into apartment	11.7%	11.9%	0.02	1	0.90
Helped furnish apartment	26.4%	26.3%	0.002	1	0.96
Provided rehabilitation services	52.4%	46.9%	7.8	1	**0.005**
Provided substance abuse services	51.9%	42.6%	21.2	1	**p<.0001**
Provided psychotherapy	27.7%	35.4%	16.420	1	**p<.0001**
V. Reasons for Termination (9)					
Lost housing voucher	31.4%	40.1%	2.41	1	0.12
Substance abuse relapse	45.4%	39.4%	1.10	1	0.29
Did not tolerate closeness of case management	45.9%	31.8%	6.64	1	**0.01**
Left to purusure treatment elsewhere	11.6%	12.5%	0.06	1	0.81
Veteran accomplished goal of limited improvement.	24.7%	25.0%	0.00	1	0.95
Significant improvement	26.2%	24.8%	0.08	1	0.78
VI. VA mental health visits (non-VASH or HCHV)(2,10)					
Year 1	70.1	47.1	17.67	1,1157	**0.0001**
Year 2	43.3	25.3	14.59	1,1157	**0.0001**

(1) Contact with specialized VA homeless programs (HUD-VASH or HCHV)(based on computerized administrative workload data).
(2) Values for experimental condition in the current analysis differ slightly from those presented in the experimental analysis because the start time for those analyses was the date of randomization, while the start time for these is the date of baseline assessment.
(3) Average number of contacts among those with any contacts.
(4) Years from baseline assessment to last contact documented on case manager clinical summary up to 2 years later.
(5) Average score on five items, scored on a 0-6 scale.
(6) Median number of months from randomization to obtaining voucher among those who obtained a voucher.
(7) Sample limited to clients who found housing using allocated voucher.
(8) Based on quarterly case management reports completed during the first year (most reports followed initial housing search and reflect subsequent case management activitiy).
(9) Reason for discharge according to case manager's assessment among those discharged (can be more than one).
(10) Other outpatient VA psychiatric or substance abuse services (based on computerized administrative workload data).

V. Reasons for Termination (most important)(9)
Ineligible for voucher (never obtained or lost)
Substance abuse relapse
Did not tolerate closeness of case management
Terminated with little or no improvement.
Terminated with some improvement.
Other

Table 8. Overall outcome means: HUD VASH (1)

	Exerimental HUD-VASH N=182 (2)	Observational Sample N=976	t	p
Housing				
Days housed	57.98	67.46	1.05	0.29
Days in institutions	18.27	12.57	0.95	0.35
Days homeless	13.39	10.77	0.40	0.69
Subjective QOL: Housing	4.46	4.42	0.11	0.91
Housing Problems	0.352	0.523	1.39	0.17
Housing Quality	0.646	0.657	0.18	0.86
Clinical Status				
Days Drank to Intox.	1.6	3.6	1.45	0.15
Days Worked of past 30	6.78	7.14	0.13	0.89
Alcohol index (ASI)	0.12	0.13	0.15	0.88
Drug index (ASI)	0.063	0.073	0.32	0.75
Psychiatric Index (ASI)	0.254	0.183	0.92	0.36
Medical Index (ASI)	0.28	0.20	0.88	0.38
Community Adjustment				
Employment index (ASI)	0.186	0.207	0.30	0.77
Legal Index (ASI)	0.059	0.14	1.36	0.18
Total Income	$629	$666	0.23	0.82
Expenditures on SA	$70	$132	1.03	0.31
Social Network Size	11.3	8.2	0.93	0.35
Social Contact	38.1	20.95	1.33	0.19
Social Support	7.68	5.88	1.03	0.31
Subjective QOL: Overall	4.28	4.09	0.38	0.70
Subjective QOL: Family	5.2	4.4	1.65	0.10
Subjective QOL:Finances	3.21	3.69	1.02	0.31
Subjective QOL:Health	4.48	4.6	0.31	0.76
Subjective QOL:Social Rels.	4.30	3.96	0.83	0.41
Arrests: Major Crimes	0.28	0.27	0.07	0.94
Arrests: Minor Crimes	0.26	0.12	1.54	0.13

(1) Repeated measures mixed models using Proc Mixed of SAS (R) Version 8.0.
(2) Outcome means for experimental condition in the current analysis differ slightly from those presented in the experimental analysis because the later is based on time from randomization while the current analysis is based on time from baseline assessment and is adjusted for. baseline differences presented in Table 6.

Table 9. VA treatment costs over two years after baseline assessment (1)

	Exerimental HUD-VASH N=182	Observational HUD-VASH N=976	F (2)	p
Total VA health care costs.	$28,397	$27,194	0.22	0.64
Outpatient care	$13,668	$9,189	24.22	**p<.0001**
Outpatient mental health care	$8,090	$5,541	15.56	**p<.0001**
Outpatient medical-surgical care	$1,149	$1,253	0.63	0.43
Homeless case management (3)	$4,429	$2,394	110.8	**p<.0001**
Inpatient and residential care	$14,729	$18,005	1.81	0.18
Inpatient mental health care	$8,478	$10,030	0.84	0.36
Inpatient medical-surgical care	$2,638	$4,691	2.16	0.14
Residential care (4)	$3,613	$3,284	0.41	0.52

(1) Values for experimental condition in the current analysis differ slightly from those presented in the experimental analysis because the start time for those analyses was the date of randomization, while the start time for these analyses is the date of baseline assessment.

(2) df for all models are 1,1157.

(3) Case management contacts with either HUD-VASH or HCHV staff.

(4) Including VA residential and domiciliary care and non-VA care funded through VA contracts.

Table 10. Non-VA and total societal costs over two years (1).

	Experimental Sample N=182	Observational Sample N=976	F (1)	p
Non-VA Costs				
Non-VA Health Costs	$6,564	$6,296	0.03	0.87
Mental health	$3,374	$2,713	2.13	0.14
Non-mental health	$3,190	$3,583	0.06	0.78
Non-Health Costs	$666	$1,368	2.35	0.13
Shelter	$1,747	$2,529	3.90	**0.05**
Incarceration	$536	$134	22.70	**p<.0001**
Administrative Costs of Transfer Payments (excluding voucher)	$235	$262	2.38	0.12
Administrative Cost of Section 8 Vouchers (2)	$623	$596	0.38	0.38
Earned Income (productivity)(3)	($2,475)	($2,153)	3.33	0.07
Combined VA and non-VA Costs				
VA Health Costs (from Table 4)	$28,397	$27,194	0.22	0.64
Total health Costs (VA and non-VA)	$34,961	$33,489	0.23	0.63
Total Societal Cost (4)	$35,627	$34,857	0.06	0.81
Incremental cost of HUD-VASH (difference between groups)	$770			
Annualized incremental cost	$385			

(1) Estimated on the basis of regression model using available interview data on non-VA health and non-heath resource use.
(2) Based on PHA and HUD administrative costs and duration of possession of voucher, averaged over all participants, not just those who received a Section 8 Voucher)
(3) Productivity (earned income) increases societal resources and thus is considered a negative cost.
(4) Sum of VA Health costs, non VA health and non-hea;th costs.